



June 1989

Vol. 2 N° 9

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Archive

The Subscription Magazine for Archimedes Users



A3000 – The New BBC Microcomputer

D.I.Y. Hard Disks for A410/1

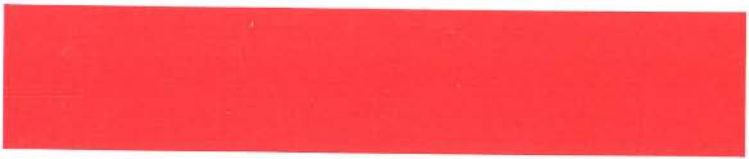
BASIC Compilers Compared

Random Numbers and Sorting

Render Bender – Ray-Tracing and Animation

Reviews: Holed Out, Computerware Hard Disks,
Shareware No10

Hints and Tips (8 pages) + all the usual sections.



"I hate RISC-OS!!!"

Why did I ever bother saying I would sell RISC-OS through Archive? The profit margin is not huge, but I did it because I realised that a lot of people would want to buy it, so it ought to be a worth-while project. How wrong can you be?! It seems that I have been let down very badly by Acorn. At the time of writing (29th May), of the 1,300 sets I ordered, only about 400 have arrived and none at all have been delivered for over two weeks. I placed an order for 1,000 sets on 1st February and yet, if you shop around, you will find that various other dealers have them in stock – on the shelves, unsold!

Yes, I know, I should just be patient, but would you like to spend all day on the telephone explaining the situation to frustrated would-be RISC-OS purchasers and coping with the administration of cancelling orders and returning cheques for all those people (rapidly approaching 10% of those who ordered) who have managed to get their RISC-OS chips from somewhere else!

I will continue to leave the latest "RISC-OS News" on Eureka and on my Ansaphone. If you could avoid ringing the office during office hours, that would help greatly. Thanks for your continued patience.

On a happier note...

Things do seem to be improving rapidly in terms of the availability of hardware and software add-ons for the Archimedes – this is borne out by the fact that, in addition to the reviews in this current issue, I have another seven that would not fit in, despite the fact that we have continued to have the four extra pages that we started with a couple of months ago. This increased supply of hardware and software can only be helped by the coming of the A410/1, A420/1, A440/1 and the A3000, all of which are even faster and yet are still software (and largely hardware) compatible with the existing A310 and A440. So, we look to the future with expectancy.

Looking to the future...

Thanks for the vote of confidence which I received from those of you who have already paid for volumes 3 and 4 of Archive! (You have avoided the price rise that is likely to come at the start of volume 3.) I trust that we will continue well into the 1990's, but I am always very much aware that, as things stand, the continuance of Archive is rather too heavily dependent on me personally. If I died or became incapacitated, there would be rather a gap long before the next issue of Archive appeared. I'm sure someone would pick it all up and keep it going, but to avoid the problem, I will try to make the whole thing less dependent on me.

Thanks again for **your** support. May God bless you all!

A handwritten signature in dark ink, appearing to read "Paul B." with a stylized flourish.

Archive

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Products Available

• **Acorn Selling off old stock of A440's** – Does anyone want one of the old style A440's (with 20 Mbyte drive)? Acorn are doing them at a special price, so we can sell them for £2750 (inc VAT & carriage). That price **includes** colour monitor and RISC-OS. (Remember that the new 440/1's with 50 Mbyte drives cost £3391 **without a monitor.**) Let us know fairly quickly if you want one. I don't think they have got vast stocks of the things.

• **BASIC Compilers** – We now have both Risc BASIC from Silicon Vision and Dabs Press' ABC version 2 in stock, though no sign yet of Mach Technology's offering.

• **CLabel** – A label and ticket printing utility for just £6.95 from Z & Z Software.

• **Film-Maker** – The interactive 3D animation system, £79.95 from Silicon Vision is now in stock. (£69 through Archive).

• **Geoscan** – a computer database and program on world development for A310 and up. Gives information in the form of text, tables, maps, graphs and diagrams about 100 countries of the world. Suitable for geography, economics and general studies in schools and colleges from middle and lower secondary upwards. Costs £45 inc VAT and p&p from Passkey Marketing.

• **Golf Game – Holed Out!** – A new game from 4mation has just come into stock – a 3D animated golf game offering match or stroke play, 14 clubs, 4 skill levels, left or right handed players, variable wind speeds, digitised sound etc, etc. Reviewed in last month's A & B Computing as 'Game of the Month'. (See also page 38) (£19.95 or £18 through Archive)

• **Hard Drives** for the new 400 series machines including cables and metalwork – Computerware drives are available through Archive: 20 Mbytes for £230 (inc VAT & carriage) and 40 Mbytes for £420.

• **Ibix the Viking** – £19.95 from Minerva (£18 through Archive) is "more than just a game". It is basically a maze game along the lines of Hoverbod and Thundermonk but it has three completely different levels. Young children can play it at the

beginners' level, then there is a harder level for the more adventurous and finally an editor level in which you can create your own mazes and your own characters. Hence the break in the tradition of all Minerva's games costing £14.95.

• **Integrex Screen Dump** from Musbury Consultants now has a quarter size dump as well as all the other sizes. If you have an older version which does not have a copy of this dump, send your disc back to Musbury and they will up-date it f.o.c. (N.B. This does not apply to the Canon dump because the Canon printer does not have the extra graphics mode necessary.)

• **Newsmaster 2**, from LTS, £60 + VAT, improves on their original DTP package (though it still works through the PC emulator) by allowing screens to be imported from other programs such as Lotus 1-2-3 and PC Paintbrush. It also has improved printing quality.

• **PrintMaster** – Also available from LTS is PrintMaster, £40 + VAT, for designing posters, long banners, headed stationery, calendars, greetings cards etc. It has ten fonts, displayable in 5 styles, 11 different borders and 120 clip art graphics plus a graphics editor for creating your own pictures.

• **Numerator** – Maths learning package for Logotron Ltd is now available in a newer, bigger, better etc format which is Arthur and RISC-OS compatible. £69 or a site licence for £250.

• **PAL programmer from Atomwide** – A single width module with its own separate power supply is provided with software to allow you to compile and program all the commonly used 20 and 24 pin PAL devices. £199 + VAT + £2.50 carriage (or £220 through Archive).

• **RAM upgrade for 410/420** – Technomatic have ram chips in stock at £180 + VAT + carriage per 1 Mbyte. All you have to do is open up the computer and plug in the chips (the right way round!) – couldn't be easier.

• **RISC-OS versions of CCD software** are now available: Fortran Libraries, £49.50 (reviewed Archive 1.8 p 20 and 1.9 p 22), Xed Text Editor,

£19.50 (Archive 1.9 p 23) and Printer Buffer Module £12.50 (Archive 2.1 p 30). They also have a new product: **C to Fortran Interface Tools** which facilitates conversion of programs between the two languages, £34.50. (All prices inclusive of VAT & p&p.)

• **ScanLight** – 200 d.p.i. A4 width hand held scanner with podule and software – works under Arthur or RISC-OS. Ideal for use with graphics, art and DTP programs. Now in stock at £449+VAT + carriage or £495 inclusive through Archive.

• **Science Frontier 40 Mbyte Hard drives:** For 310's there is a podule plus drive plus cables etc £621, for new 410's there is a drive plus cables plus metalwork for £435.85 and if you just want a bare drive to replace an existing one, i.e. without cables or metalwork, they charge £419.75. (Prices are inclusive of VAT and carriage.) The drives in each case are 35 ms Fujitsu drives and the podules are Acorn's own. They are available from G.E.S. Computer Supplies in Aberdeen and are, at the time of writing, available from stock.

• **Sound Samplers from Armadillo** – Armadillo now do a range of sound samplers, starting from the A448 (£135 +VAT +carriage or £150 inc. through Archive) which is an 8-bit mono sampler with a maximum sample rate of 41 kHz. It has its own software allowing for loading, saving, editing, sampling and playback. The sampling and playback can be controlled through BASIC, Assembler, or C via system calls. Then there is the A448b which is a stereo version of the A448 which also includes a new WIMP software package, "Highnote". (£160 +VAT +carriage or £180 inc. through Archive.) If you want to add a MIDI port, in, through and out, you can choose the A448m (£190 +VAT +carriage or £210 inc. through Archive). Finally, if you want 16-bit sampling (CD quality) with the HighNote software, 44kHz sampling rate with 4 times over-sampling on playback, Midi in, through and out, you need the A616 – a snip at £1150 +VAT +carriage! (or £1290 inc. through Archive.) Finally, there is fast fourier transform software which performs a 256 point FFT in

just 10 ms! Spectra Fourier Analysis package cost £60 +VAT +carriage (or £66 inc. through Archive).

• **Voice Generator** – MJD Software are preparing a WIMP based voice generator allowing you to create your own voices either by editing sampled waveforms or by combining waveforms, amplitude envelopes and pitch envelopes etc etc. No price given. Details from Mark Davis on 01-567-4284.

• **Wingpass Assembler** – There is now a version 2.06 which clears one or two floating point bugs. However, the main reason for issuing it was that the changes that Acorn made in the latest version of their linker output file created an incompatibility with relocatable modules as reported by Tom Crane last month (Archive 2.8 p 41). You can get the new version by sending your Release Disk back to Wingpass and they will replace it free of charge.

Review Software Received...

Apart from reviews already written we have received review copies of the following software: CLabel, and Clares' Arcade 3 **A**

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Forthcoming Products

• **A3000 – the new BBC Microcomputer** – Acorn say that they have already had orders for 3,000 machines including 500 from Durham L.E.A. On Acorn's past performance, and since I doubt that they will be planning to make more than a few thousand before the end of the year, this does not bode too well for the average man-in-the-street getting hold of one before... well, what do you think? Christmas? Or is that being too hard on Acorn? We've ordered a couple from the distributors and will obviously shout fairly loudly when they arrive. Acorn say that there will be a "limited number" of machines available in June, but these are being offered to L.E.A.s on a "5 maximum per L.E.A." basis. They say that "full production" is due to start in July.

• **Atelier**, £99.95 (or £85 through Archive) is a 256 colour art package complete with animation – Peter Clements who is doing a review for A & B says it is very, very impressive and thinks that it is even better than Pro-Artisan (and cheaper!). In particular, he says that the range of different fill routines is outstanding. Availability? Well, it may be ready by the time you read this. Please ring if you are interested.

• **Mach Technology Ltd update** – Further to the item on page 4 of the May magazine about ultra cheap drives and other software from Mach Technology, I gather from them that the drives advertised at £249 are firstly not inclusive of VAT – the advert was a little confusing on this issue. The actual cost is thus £286.35 plus carriage – still very cheap! Secondly, they are 65 millisecond drives and thirdly they are external drives, boxed with p.s.u., attached by cable to an internal podule. There is at present no connector for a second hard drive, either internal or external, but Mach Technology say they are going to do upgrades later.

Having said all that, they are offering a range of drives, 20, 30 and 40 Mbyte, all external, all including podule at prices up to £399 + VAT. They said they would send me a sample drive at the beginning of May but I haven't had one yet – obviously I will let you know as soon as possible whether they

are as good value as they seem. In fact I rang them today and they are still not available for sale. They hope they will be available "in a week or so".

Mach Technology also said that the other three items of software, the Database, Modula-2 and Mach BASIC compiler were "ready for shipping". However, we haven't actually received any of them yet. They are now saying (24th May) that Hyperbase should be "two or three days", Mach BASIC should be "about a week or so" but Modula-2 is "a bit further off".

They are also promising other exciting products. Firstly there is an MS-DOS podule with an 80286 processor and 640k of ram. This will be available for £299 inc VAT. Secondly they are promising memory upgrades for the 300 series computers – £391 for upgrade to 2 Mbytes and £598 for upgrade to the full 4 Mbytes.

• **Structural Analysis** – Neale Smith has taken a 2D structural analysis program written for the BBC by Dr David Brohn and converted it and enhanced it on the Archimedes. This is to be marketed in the near future, but in the meantime, enquiries should be sent to Neale Smith, 13 Paddock Wood, Prudhoe, Northumberland, NE42 5BJ.

• **Studio 24 Plus Version 2** will be available later in the year and will be an upgrade for existing customers, handling data from version 1.0. It will retailing at approx £149.00. It will support Render Bender pictures during playing and various other animation techniques, from realtime notation to video, using SMPTE timecode from the EMR SMPTE podule if required for serious film and art work with music. Other features include full multitasking control and extra edit pages, music keyboard recorder function control. A professional version is also being prepared called MegaStudio with unlimited tracks and up to 8000 Midi channel control via one cable on the EMR MINI (Musical Instrument Network Interface) expansion podule.

About to be launched is the **VuMusic** program (which creates patterns from Midi data via Acorn or EMR interfaces and can be run as a stand-alone or

within Studio 24 Plus V2.0. Price £19.95 inc VAT. The **EMR Sampler 8** module is now available – sample sounds for inclusion in SoundSynth – £99 inc VAT. Also imminent is a versatile program called **Rhythm Box** that uses grid edit pages for

making up to 8 internal sounds per bar (made with SoundSynth or from Creations disks) – each bar can use different sounds and tempo changes as well as pitch and rhythm patterns to form a complete song. Price £29.95 inc VAT. **A**

Readers' Comments

• **Bulletin Board Systems** – I have been thinking about Bulletin Board Systems since reading the article in Archive about it. Here are my thoughts:

The terminal software should run under RISC-OS and appear as an Icon on the Icon bar. The icon would indicate the status of the terminal (i.e. online etc). An option could be available to allow this icon to be writeable, displaying the current time spent online, or even the cost of the phone call! On selecting the icon, a pop up window allows operation of the terminal from the desktop. At any time, the window can be closed, but the terminal will continue working in the background (hence the requirement for the icon to indicate Online!).

I will divert now to discuss the operation of the terminal in conjunction with the BBS. The terminal will contain a series of indexes of the various elements of the system. These elements I have decided should be:

- a – Bulletins
- b – Personal mail
- c – Messages (within SIGs for instances)
- d – Software
- e – User list

These indexes contain basic info about the particular type of file (everything is file orientated for reasons I will explain later) such as the filename, date, author etc, in fact pretty much like the ADFS filing system, but with a few minor differences. When you log into the system, these indexes will be updated to reflect the current BBS status so that, at any time (even Offline!) you can browse the bulletin board to see what is available. There could be an option within the software to only update certain indexes (for instance, not everyone will be interested in updating the user list every time).

After this, any pre-prepared messages and mail are uploaded; and mail and personal messages (those

marked specifically for the user) are downloaded. The system then logs off. The user may now, while offline, read mail and personal messages and browse the BBS via the indexes. The user may then select messages and software to download and upload. After this, the system goes back online and uploads and downloads as necessary, while the user gets on with something else (like drinking coffee?).

Useful bits here could include a call charge logging system (requiring tables of charges etc to be supplied) and, before logging on for the main session, an estimation of the cost of the call and a confirmation box before continuing! All this is not really anything new.

The actual operation of the software is envisaged as follows: The indexes for the bulletin board are maintained as a filing system and appear next to the disk drives etc. On opening this, the “directory” box shows directory icons for the different areas of the board (in this way further areas could be added). Opening these directories shows the information in a pertinent form. As an example, opening the “Software” directory gives a catalogue of the files in Icon form (or long info) as per the RISC-OS desktop. The long info will contain additional details such as author, and whether it has been uploaded yet!

The Mail directory and the Message directories will probably be scrolling text lists (there is no point in putting icons as messages should all be of the same type. There is scope, however, for iconising them to indicate which SIG they originated from!). The User list will probably be displayed as a file in the “Root” rather than a directory. This is simply a database file, but a utility will probably be provided to allow browsing when this icon is clicked. It may even be possible to use this info in other database programs you have written yourself (I don’t know what for??).

Messages and mail are prepared in a text editor and dragged into the mailer icon. This icon accepts details about the subject and address (perhaps by pointing at a name in the user list!). The mailer combines the address(es) and message ready for sending. This may be saved onto disc, or into the Mail/Message directory (perhaps there should be two directories for each element: one for uploading, one for downloading) by dragging an icon to the appropriate place. Files are selected for uploading/downloading by dragging the icons around.

In this way, the whole procedure fits in with the rest of the way that RISC-OS works. Another useful utility would be the desktop ARC program. This installs as a filing system (a bit like Tinydirs) and allows a file to be opened as an Archive. This presents a directory to which files can be dragged to add to the archive, or from which files can be dragged to extract from the archive. I am currently investigating whether it is possible to write a program to do this based around Beebug's ARC program (if only I had more time!).

Another thought I had was to include a dictionary on the system which can be periodically updated. This will be echoed on the user's terminal in the same way as the element indexes. The dictionary will probably not be complete words, but a list of common letter groups found in English. This can be used to compress and decompress text files in much the same sort of way as Viewspell does in its internal dictionaries. Otherwise, some other type of compression routine may be used.

Although the system is designed to work automatically, it is nice to have some sort of live feedback with the sysop. One option could be, whilst online, to Page the sysop (by clicking an icon). If available, the current action will suspend, and a window open up allowing two way typing. Closing this window will resume the automatic operation. Of course, the Sysop can also page the user, and this will cause the Paging icon to flash. If the user wishes to chat, he can click the icon. If he doesn't (or he is not present), the system will continue uninterrupted.

Of course, all of this is merely fantasy although it is possible. The main reason I am putting all of this out

is in the hope that someone with the resources required is reading.

One final thing. Although all of this system has been based around the Archimedes, it is only the terminal software that is specific to Archimedes. The data transfer over the lines should be accessible to anyone, so it is possible to have A-megre or Atari (or whatever) versions of the software, although they probably won't be as sophisticated or easy to use.

Yours in a dream, Keith Milner

• **Serious criticisms** – Since the beginning of volume 2 of Archive, there has been a measurable decrease in the level of programming and you tend to make more and more assumptions that all Archimedes owners have an endless source of money and that we all own RISC-OS and that we all have First Word Plus and that we are all scientifically-minded. Who really wants to know how to calculate PI to a million places of decimals?

Also, the level of reviews has increased dramatically. The May issue is over 50% reviews. How about paying programmers for their articles in order to attract more of them?

By all means send money to charity, but how about spending some money on setting up Access and Visa facilities?

Another suggestion is to supply all members with free technical help. I would personally pay the going rate for software and know that technical help is a phone call away rather than get a discount off the price of the software.

How about printing my criticisms? But, on reflection, looking back at old issues, I notice that you do not like printing criticisms of Archive and I find your reporting very biased.

Mark Barr, Worcester Park, Surrey. (Edited from a long letter)

In his suggestion that we pay for programs, Mark said that people are unwilling to spend hours doing programming only to give away the results. I think that he underestimates the very real goodwill that there is around in the Archimedes market at the moment. What about the 12 Shareware discs that we distribute? They are full of programs and all were given free of charge.

Re: Access and Visa, it does not seem sensible to me to give 6% to a company to handle the money transaction. If anyone really needs something urgently, we are usually very happy to send the goods out straight away, trusting the person to send a cheque by return. We have done this quite a few times, and no one has let us down. It's much nicer to work on trust than with plastic!

Too many reviews? Well, yes, I had noticed the increase, but that is because there is a lot more

software and hardware available now so the reviews are, in my view, more important to help people to make up their minds. Also, it does depend on what articles people send in. For example, I would love to have had more articles on hardware, but no one seems to be doing anything in that area.

*Free Technical Help – I'm afraid this just isn't possible without taking on extra technical staff and that would cost more than could be funded by removing the discounts on software. Sorry. Ed. **A***

Comments Various

• **Educational Shareware Discs** – I've had a suggestion from a couple of readers that we do a disc or discs of educational programs, especially in view of the coming of the A3000 which should be taken up fairly enthusiastically in the education field. Fine idea but it's over to you to produce the programs and send them in to us. Can you make it clear when you do send programs whether or not they have been tested on RISC-OS? Thanks.

• **RISC-OS Compatible Shareware?** – We have had one or two comments or complaints that some of the Shareware programs do not work under RISC-OS. I'm afraid that there is not a lot that we at Archive can do about the problem – it's up to the software writers themselves. So, if you have sent in some software that has been published under the Shareware scheme, please, as soon as you get access to RISC-OS, can you test your software and, if necessary, send us an updated program and, if the modifications are simple, a statement that we can publish in the magazine to tell people how to update their programs themselves. Please make sure, when you do write in, that you state clearly on which Shareware and/or monthly program disc, your software was published. Thanks.

• **What will we do with the money?** We have had lots of suggestions about what we should do with any excess money. Thanks for all the very different suggestions. Many thanks to all those who wanted me to be sure I was providing for "me and mine" before giving money away. I can assure you that I take very seriously the biblical (new testament) injunction that any Christian who does not provide for his family is worse than a heathen.

Even so, there is still some left over (well, there is at the moment!) and so what I am thinking of doing is choosing three charities, one local, one national and one international and, for the time being, dividing the money equally between the three. I have chosen the local charity as the Norwich Toy Library which provides toys and recreational activities for handicapped kids. It is run by two good friends of mine, Jack and Margaret Wymer, both of whom are themselves wheel-chair bound, and they want to increase the breadth and depth of the computer facilities that they provide for other disabled folk. (They have BBC's, but I think it's about time they got hold of an Archimedes!) They may have a programming project for us to do, so I may be looking for someone to do a bit of programming too, soon.

Although we haven't got the Careware idea going yet (where is all this software that people were going to send?), some people have already made voluntary donations and some have sent money for the plastic library 10-disc boxes (£1 for two boxes) so we have raised almost £100 already. **A**

Contact Box

• **Packet Radio** – Any Archimedes users interested in packet radio, please leave message or contact Tim Saxton at G3LJR@GB7CHS.

• **Archimedes Contacts** wanted from all over the world. Write to Poly Traka, 32 Ventovri Street, Holargos 155-61, Athens, Greece. **A**

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Hints & Tips

• **External drive hang-ups** – If you have an external 5.25" drive configured and it is not kept on-line (i.e. it is switched off) then the machine hangs up if the ADFS is searching for a named disc which is not in drive 0 at the time that the command was issued, e.g. when attempting to copy file(s) from one 3.5" disc to another. The solution appears to be either always have the external drive switched on, or to configure it out of the system during periods when it is switched off.

• **GWBASIC to BBC BASIC** – I wanted to convert a GWBASIC program to a BBC BASIC one, but both BASIC's store programs with the keywords tokenised. Therefore I needed the equivalent of the *SPOOL command. The answer seems to be that from GWBASIC either:

```
SAVE "filename",A
or
LIST , "filename"
```

Both give a version of the listing which, when ported across via putils, can be *EXEC-uted.

• **Mouse problems** – I had a problem with my mouse. Sometimes when I moved the mouse down, the pointer moved UP. At other times it worked perfectly. I tried everything – including measuring the electronics inside the mouse, and inside the keyboard, adjusting the sensitivity and cleaning the inside and outside of the mouse. Finally I discovered that the problem was a broken wire in the cable out from the mouse. Odd Bakken

• **NEC multisync modifications** – With a NEC multisync II monitor, I found that the horizontal width of the picture was not optimal. There was a black border on each side of the picture and, in modes 18-20, the picture was even smaller, making the letters a little hard to read. I called the local dealer and got a copy of their service manual. You can adjust the horizontal size with coil L505. I got some improvement by removing the core of the coil but not enough. So I shorted the coil completely (after consulting the dealer, who said it would not harm the monitor). By doing this I got a 10% wider picture. (I still have the distortion of the top lines in mode 18-20.) Odd Bakken

• **OS_PrettyPrint** – There has been very little in the literature about the use of OS_PrettyPrint to avoid word wraparound in, for example, the preparation of instruction notes at the beginning of a program. (You can use SYS &44 instead of writing the full command). All that is needed is a simple BASIC program such as :

```
10 SYS &44, "<Block of words>"
20 PRINT; " ";:REM Insert space
or 20 PRINT:REM New Line
30 SYS &44, "<Continuation of
      text>"
40 PRINT; " ";      etc.
```

The text in line 30 continues from the point where it ended in line 10. Unfortunately the OS command strips the leading and trailing spaces from the block of text. The PRINT statements are therefore necessary to separate the end of the text in line 10 from the beginning of the text in line 30 or to force a new line. The word block length has the standard BASIC line limitation which amounts to roughly three lines of text in the 80 chars/line modes. The command works in any mode and by judicious placing of PRINT and COLOUR statements you can have sections of the text or even single words in colour.

• **Pipedream and the LC10** – To print in colour on a Star LC 10 colour printer, if Pipedream is configured with a printer driver which includes the following codes, the various printing styles available on the Star LC 10 C can be selected when the printer is switched on, and printed in colour.

	On	Off	Description
H1	27 114 1	27 114 0	Red Text
H2	27 114 2	27 114 0	Blue Text
H3	27 114 3	27 114 0	Violet Text
H4	27 114 4	27 114 0	Yellow Text
H5	27 114 5	27 114 0	Orange Text
H6	27 114 6	27 114 0	Green Text

• **Pipedream line spacing** – (Colton Software's reply to a request for 1.5 line spacing on Pipedream) Pipedream knows only integral line spacing; single, double etc, but the line spacing on the printer can be set independently by sending out some codes with

the printer-on string (PON). For example, PON ESC "2" would give 1.5 line spacing on Epson compatible printers.

• **Multi Sync Owners!** Out here in New Zealand, the average multisync monitor costs about £60 more than the standard Acorn monitor. As a result around 60-80% of Archimedes owners have multisync's. I haven't a clue as to why they are so much dearer in the U.K. but suggest that someone somewhere is making a great deal of money! Most of the programs available don't provide a multisync option which is a real shame as that extra 256 pixels make all the difference. I've tried to convert some programs but haven't had much luck except for Render Bender.

To convert Render Bender proceed as follows:

Make a new backup of your Render Bender System Disc. Label it "Render Bender Modes 15 & 21" or somesuch. Enter BASIC and load the main program "!RENDER.RENDER". Change or add the following lines.

```
60 DIM loadadd &F100,sbl%32*1023
      :org=loadadd+&A100
2550 XRES=640:YRES=256:SC%=100:
      DES=1000:IND=1.5:SKYCOL=13
      :SKYDEP=600:AVE=1:SHAD=1:SHGR=0
2950 IF YRES=256 AND SCRADD%<=
      &1FB0000 YRES=512:PROCbox
      (17,16,14,2,"HIGH*RESOLUTION"
      ,14,0):ENDPROC
2960 YRES=256:PROCbox(17,16,14,2,
      "LOW*RESOLUTION",14,0):ENDPROC
3981 IF RES=320 THEN XRES=640:
      YRES=256
13590 vars!xlim=XL:vars!ylim=YL
      :vars!reso=XRES
14010 A$=LEFT$(name$,8):A$=A$+
      STR$FILFR%:IF YRES=256 ENS%
      =&28000 ELSE ENS%=&50000
14090 XL=XRES/SIZE%:YL=YRES/SIZE%
      :PROCcoffin
14110 IF YRES=256 MODE15 ELSE MODE21
14190 IF YRES=256 MODE15 ELSE MODE21
14280 XL=XRES/SIZE%:YL=YRES/SIZE%
      :PROCcoffin:SCROFF%=1
      :PROCisflooron
14290 IF YRES=256 MODE15 ELSE MODE21
15150 IF YRES=256 PROCbox(17,16,14,2,
      "LOW*RESOLUTION",14,1)ELSE PROCbox
```

```
(17,16,14,2,"HIGH*RESOLUTION",14,1)
11320 GCOL63 TINT 255:VDU5:IF
      YRES=256 PRINTTAB(0,31);"Click
      Mouse" ELSE PRINTTAB(0,62);
      "Click Mouse"
14380 GCOL63 TINT255:IFYRES=256
      PRINTTAB(0,31);"Time taken ";
      :PROctime(TI):GCOL 25:PRINT;
      " Click mouse" ELSE
      PRINTTAB(0,62);"Time taken ";
      :PROctime(TI):GCOL 25:
      PRINT;" Click mouse"
SAVE ":0.$.!RE*.RENDER"
```

Then to modify the Picture Compressor

```
$.!RE*.UTIL*.PICCOMP
*BASIC
*LOAD :0.$.!RE*.UTIL*.PICCOMP 8F00
*ACCESS :0.$.!RE*.UTIL*.PICCOMP WR
!&90C0=&E3520015
!&90C4=&03A0B805
!&92F0=&E3500015
!&92F4=&03A08805
*SAVE :0.$.!RE*.UTIL*.PICCOMP 8F00+534
*SETTYPE :0.$.!RE*.UTIL*.PICCOMP &FFA
```

To modify the Animator

```
*BASIC
LOAD":0.$.!RE*.UTIL*.ANIROUT"
140DIM buff &50000,DUM 1:anipo%=DUM
      +&6000:PROCboot!:anipo%=0
1371IF !mode=21 length%=&50000
2251IF MODE=21 length%=&50000
SAVE ":0.$.!RE*.UTIL*.ANIROUT"
```

Finally to get Render Bender going you need a new startup file

```
*BUILD :0.$..Rend21
*ECHO <22> <21>
*SET RENDER :0.$.!RENDER
*set OBEY$DIR adfs::0.$.!RENDER
*set FROM$DESK 0
*SET RendHard1 adfs::4.$..GRAPHICS.
      !Render \ or your path here
*SET HardRoot $
*RMLOAD <RENDER>.Utilities.FSLOAD
*RMLOAD <RENDER>.Utilities.PicComp
*BASIC <RENDER>.START
<Escape>
*SETTYPE :0.$..Rend21 &FFE
```

Then to run Render Bender using:

Dabhand User Update

Archimedes Basic Compiler Version 2 the Quality BASIC V Compiler
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Archimedes Basic Compiler

Version 2 Now Available!

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Hints & Tips

```
*CO. SCR. 320K
<ctrl-break>
*:0.$ .Rend21
```

All this is supplied on the monthly program disc as a series of exec files so to modify Render Bender you just do this (where <comment>=just that!)

```
<insert Render Bender Disc>
LOAD":0.!RENDER.RENDER"
<insert program disc and *MOUNT or
                                use winnie>
*EXEC Rendermods.RendMods
<insert Render disc and *MOUNT>
SAVE ":0.$ .!RENDER.RENDER"
LOAD ":0.!RENDER.UTIL*.ANIROUT"
<insert my disc and *MOUNT or use
                                winnie>
*EXEC Rendermods.AniMods
<insert Render disc and *MOUNT>
SAVE ":0.!RENDER.UTIL*.ANIROUT"
COPY Rend21 across to $ <On Render
                                Disc!>
*WIPE $.!RE*.U*.PICCOMP F~C <get rid
                                of old PicComp>
COPY PicComp across to $.!RENDER.
                                UTILITIES <On Render Disc!>
```

then you should be ready to go!

• **Eigenvalues of a matrix** – The following program is meant for readers who are interested in the determination of eigenvalues of a matrix. It is based on the idea that the eigenvalues of a matrix do not change by a similarity transformation. Decomposing a square, symmetric matrix S in its lower and upper triangular forms (L and U respectively satisfying $LU=S$) gives a new matrix UL having the same eigenvalues as S , since $UL = (U^{-1})ULU$. It can be proved that by repeating this process, a matrix is obtained containing zero elements, except for the eigenvalues residing on the main diagonal.

Consider an arbitrary matrix M , having a number of rows equal to or greater than its number of columns. Then $M'M$ (M' standing for transposed of M) is a square, symmetric matrix having the same eigenvalues as M . Some of these values may equal zero indicating that the dimensionality of M is smaller than its number of columns. Or in other words, the matrix spans an x -dimensional space, where x equals the number of non-zero eigenvalues of M .

```
10 REM >Eig_values
20 :
30 *****
40 REM Eigenvalues of an arbitrary
50 REM matrix. E.D. Engelhardt,
                                March 1989
60 *****
70 :
80 PROCinit
90 :
100 PROCmenu
110 :
120 PROCinput
130 :
140 start%=TIME
150 PROCmain
160 end%=TIME
170 :
180 PROCprint
190 END
200 -----
210 DEFPROCinit
220 @%=&0A0A:CLS
230 ENDPROC
240 -----
250 DEFPROCmenu
260 OFF
270 PRINTTAB(31,12)"EIGENVALUES"
280 PRINTTAB(27,14)"[1] Random matrix"
290 PRINTTAB(27,15)"[2] Fixed demo
                                5x4 matrix"
300 PRINTTAB(27,16)"[3] Fixed demo
                                4x4 matrix"
310 ENDPROC
320 -----
330 DEFPROCinput
340 while=TRUE
350 WHILE while
360 CASE GET$ OF
370 WHEN "1":while=FALSE:ON
380 REM Generate random matrix M,
                                col% columns and row% rows
390 REPEAT:
                                INPUT" Rows : "
                                row%:UNTIL row%>0
400 REPEAT:INPUT" Columns
                                <= rows : "col%:UNTIL col%
                                <=row% AND col%>0
410 CLS:
                                PRINT" Rows : "STR$
                                row%" Columns : "STR$col%
420 row%-=1:col%-=1
430 DIM M(row%,col%)
440 FORr%=0TOrow%:FORc%=0TOcol%
450 M(r%,c%)=RND(1)*SGN(0.5-
                                RND(1))
460 NEXT:NEXT
```

```

470      :
480  WHEN "2":while=FALSE:ON
490      REM *** Fixed data for demo
          5x4 matrix having one zero
          eigenvalue
500      CLS:PRINT" Rows      : 5"
          " Columns      : 4"
510      row%=4:col%=3:DIM M(4,3)
520      M(0,0)=4:M(0,1)=3:M(0,2)=2:
          M(0,3)=1
530      M(1,0)=2:M(1,1)=4:M(1,2)=1:
          M(1,3)=3
540      M(2,0)=6:M(2,1)=7:M(2,2)=3:
          M(2,3)=4
550      M(3,0)=8:M(3,1)=11:M(3,2)=4:
          M(3,3)=7
560      M(4,0)=8:M(4,1)=6:M(4,2)=4:
          M(4,3)=7
570      :
580  WHEN "3":while=FALSE:ON
590      REM Fixed data for demo 4x4
          matrix having four eigenvalues
600      CLS:PRINT" Rows      : 4"
          " Columns      : 4"
610      row%=3:col%=3:DIM M(3,3)
620      M(0,0)=1.00:M(0,1)=0.42:
          M(0,2)=0.54:M(0,3)=0.66
630      M(1,0)=0.42:M(1,1)=1.00:
          M(1,2)=0.32:M(1,3)=0.44
640      M(2,0)=0.54:M(2,1)=0.32:
          M(2,2)=1.00:M(2,3)=0.22
650      M(3,0)=0.66:M(3,1)=0.44:
          M(3,2)=0.22:M(3,3)=1.00
660  ENDCASE
670 ENDWHILE
680 ENDPROC
690 -----
700 DEFPROCmain
710 DIM Mt (col%,row%),MtM(col%,col%)
          ,E(col%)
720 PROCtranspose(M(),Mt())
730 PROCsquare_sym(M(),Mt(),MtM())
740 PROCeigenvalues(MtM(),E())
750 ENDPROC
760 -----
770 DEFPROCtranspose(R(),Rt())
780 LOCAL v%,h%
790 v%=DIM(R(),1):h%=DIM(R(),2)
800 FOR r%=0 TO v%:FOR c%=0 TO h%:
          Rt(c%,r%)=R(r%,c%):NEXT:NEXT
810 ENDPROC
820 -----
830 DEFPROCsquare_sym(R(),Rt(),RtR())
840 RtR()=Rt().R()
850 ENDPROC
860 -----
870 DEFPROCeigenvalues(RtR(),EV())
880 REM Eigenvalues are determined
          from R-transposed x R, using the
          property that eigenvalues do not
          change by a similarity
          transformation. Rt.R is
          decomposed in a lower and upper
          tri-angular matrix, Rt.R=LU. Then
          UL has the same eigenvalues as LU.
900 REM Repeating this process
          iterates all non-diagonal elements
          to 0, and the diagonal elements
          to the eigenvalues.
910 :
920 REM E.D. Engelhardt, March 1989
930 :
940 LOCAL L(),U(),UL(),h%,c%,r%,t%,
          repeat,max,iterations%
950 h%=DIM(EV(),1)
960 DIM L(h%,h%),U(h%,h%),UL(h%,h%)
970 :
980 PRINTTAB(1,30)"Iteration      : "
          :REM This info may be left out
990 :
1000 repeat=TRUE
1010 REPEAT
1020     iterations%+=1:PRINTTAB(13,30)
          iterations%:REM may be left out
1030     REM Calculate lower triangle
          L of RtR
1040     FOR c%=0 TO h%:FOR r%=c% TO h%
1050         L(r%,c%)=RtR(r%,c%):t%=c%-1
1060         IF t%>=0 FORt%=t%TO0STEP-1:
          L(r%,c%)=L(r%,c%)-L(r%,t%)
          *L(c%,t%):NEXT
1070         IF r%>c% THEN L(r%,c%)=
          L(r%,c%)/L(c%,c%)
1080         IF r%=c% IF L(r%,c%)<0 THEN:
          FOR t%=0 TO h%:L(t%,c%)=0:NEXT
          IF r%=c% L(r%,c%)=SQRL(r%,c%)
1100         IF r%=c% AND L(r%,c%)=0 r%=h%
1110     NEXT:NEXT
1120 :
1130     PROCtranspose(L(),U())
1140 :
1150     REM Matrix similar to RtR (ie
          having same eigenvalues) is UL
          UL=U().L()
1160 :
1170 :
1180     REM Determine if diagonals of
          RtR and UL are equivalent
1190     t%=0
1200     REPEAT
1210         IF UL(t%,t%)<>RtR(t%,t%)
          :repeat=FALSE
1220         t%+=1:IF t%>h% repeat=FALSE
1230     UNTIL repeat=FALSE

```



```

1240 IF t%<=h% repeat=TRUE:RtR( )=
1250 UNTIL repeat=FALSE UL( )
1260 :
1270 REM Put eigenvalues smaller then
      non-diagonal elements to zero
1280 FOR t%=0 TO h%:UL(t%,t%)=0:NEXT
1290 FOR r%=1 TO h%-1:FOR c%=1 TO r%
1300 IF ABS UL(r%,c%)>max max=ABS
      UL(r%,c%)
1310 NEXT:NEXT
1320 FOR c%=0 TO h%
1330 EV(c%)=RtR(c%,c%):IF EV(c%)<=
      max EV(c%)=0
1340 NEXT
1360 ENDPROC
1370 -----
1380 DEFPROCprint
1390 VDU 14
1400 CLS:PRINT" Rows : "STR$
      row%" Columns : "STR$col%
1410 PRINT" Time(centisecs) : ";STR$
      (end%-start%)''
1420 PRINT" ***** Eigenvalues : "
1430 FOR c%=0 TO col%
1440 PRINT E(c%)
1450 NEXT:PRINT
1460 VDU 15
1470 ENDPROC A

```

Help!!!

- **Cobol** – Does anyone know of an implementation of Cobol on the Archimedes? either native mode or under PC emulator? Clifford Hoggarth.
- **Dual columns in First Mail** – Has anyone actually managed to get it to work? Simon Anthony
- **Mandelbrot program** in Archive 1.7 makes great pictures, so good that I would like to take photographs of them and hang them on the wall. The problem is the format and the resolution. I understand that there is a mode 21 coming in the new OS, with 256 colours and 512 lines. Is there a way to convert the program to mode 21 (or mode15) and to full screen width? Odd Bakken.
- **Noisy RISC-OS** – One or two folk are reporting noise occurring with RISC-OS. In some cases, I think it is that the buzz-fix has never been done, but some computers that have had the buzz-fix done, still get a lot of noise. Any ideas of a cure?
- **Printer Driver for LC24-10** – Anyone done a printer driver for First Word Plus for the Star LC24-10? Steve Bruntlett + various others.
- **RISC-OS mode 20 problems** – The 8 x 8 pixel system font is not centred vertically in icons in mode 20. The result is that the text is partially outside the icons and also the characters printed automatically in windows and menus are shifted up. Is it a bug? Can anyone offer a solution? Dr L Frasinski, Reading.
- **Sinclair QL link** – Does anyone know how to copy files from a Sinclair QL to an Archimedes, please? Dr H Reyners, Belgium. A

Credit where it's due...

- **ACE Computing** – Oliver Cornes tells us that Ace Computing (Tony Cheal) have produced the piece of software that he uses most – Euclid – and are also extremely good at giving help and information.
- **LMR** – a computer consultancy/repair service in Cheshire (061-962-8872), are offering a free fitting service for RISC-OS, backplanes, etc to Archive members who have purchased them through Archive. They say they see this as a way of spreading the word that not all companies are in the computer business simply to shift boxes. It's nice to see service and goodwill being combined with business acumen.
- **Colton Software** gets an accolade from Andre Liekens in Belgium. He says that Pipedream is an excellent product and when he asked Colton Software a technical question about making labels using Pipedream he had an answer back in 5 days. Well done, Colton! A

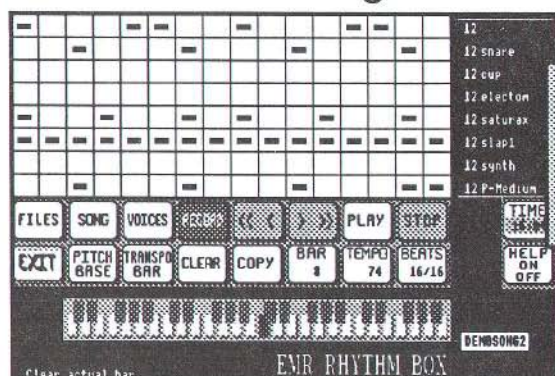
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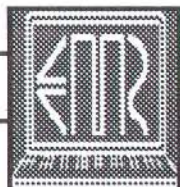
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Matters Arising

• **Mouse connectors** – In Brian Cowan's article last month about trackerballs, I said you could get mouse-type connectors from Mac User group. Unfortunately, I got it wrong. The connectors available are actually the 8-pin mini-d.i.n. keyboard connectors, not the 9-pin mouse ones. Sorry!

• **R140 prices** – No, I'm afraid we haven't managed to work a special deal with Acorn to sell R140's at £2949 – it was actually a typographical error. It should have read £3949. Sorry to raise your hopes. Mind you, even at £2949 we only had one enquiry. I suggest the Acorn marketing department are going to have to look into this one!

• **Shareware Mandelbrot**s – With reference to the 3D Mandelbrot program on Shareware 4: if you alter Lines 200, 220 to:

```
195 CASE TRUE OF
200   WHEN count%>=200:count%=0:GCOL52
205   WHEN count%>=30 AND count%<299:
      GCOL (count%+32) MOD 64
208   WHEN count%>=11 AND count%<30:
      count%=10:GCOL11
210   WHEN count%>=9 AND count%<11:
      count%=20:GCOL21
212   WHEN count%>=6 AND count%<9:
      count%=20:GCOL10
214   WHEN count%>=4 AND count%<6:
      count%=25:GCOL8
216   WHEN count%>0 AND count%<4:
      count%=15:GCOL21
218 ENDCASE
```

In Line 220 omit the MOD 64 after count%.

Using DUMMY as the data file will give a reasonable Mandscape. I haven't had much time to devote to the Mandscape package, but I have 'redone' the writefile program to work in Modes 12, 13 & 15 with iteration depths from 32 to 65535 (that should be deep enough for the most rabid!) – it's still slow compared with the ARM programs. William Doggett's program is excellent, but you cannot enter coordinates, allot colours to specified count ranges or change iteration depths. The plotfile program is nearly complete and will automatically plot any of the 3 modes (I hope!) as the writefile program now files mode and coordinates data.

• **Render Bender Competition Amendment** – From the very start a big sorry for what I am about to say. The closing date for the competition is to be delayed by one month. The reason is that I missed the boat (or rather the magazine) with the final amendments to the rules and the closing date together with the technical information on Armadeus which is below (A level exams are very time-consuming).

Apart from the closing date now being **July 16th 1989**, the competition will be judged by David Clare of Clares' Micros and the prize will be awarded at the unveiling of Armadeus at the Acorn User Show on 21st July. As David Clare will be judging it, you can either send your animations directly to him or to the Archive office. (If you do send it to David Clare or Archive, please mark the envelope Animation Competition to avoid confusion.)

I have also got an idea to help 440 owners fit the animation into a 310. The maximum memory obtainable on a 310 before the delta animator is loaded (this really determining the maximum size of sequence before you get the 'no room in memory' error from the animator) is about 720k. What you could try is to use the task manager on the RISC-OS desktop to set 720k for the application. If you don't have RISC-OS, you will have problems judging the size of animation allowed. The only other thing to do is to try it on a 310 first. David Bilsby

Armadeus is an advanced sound sampling and manipulation program that works readily with current sound samplers like the Armadillo 448, 448b and 448mb and the Wild Vision ADC 1208. Other boards will be accommodated by disc upgrades when they become available. It can, however, be used for manipulating pre-sampled disc stored sounds.

Sampled sound have many uses. They can be incorporated into your own programs and games to add the vital effect. Sound voices can be generated from a sampled instrument for example. Sampled sounds can be over laid on video tapes and can be used in voice analysis for the deaf for example but best of all it's great fun.

Features of Armadeus

- Fully RISC-OS multi-tasking application.
- Real time wave image displaying when recording or replaying.
- Multiply samples in memory at once.
- New samples can be loaded, appended, inserted or overlaid onto an existing sample.
- Stereo effect option on replays.
- Mark areas for processing.
- Processing includes echo, reverse, fade in and out, scale etc.
- Cut a marked area and erase, move, copy, replace or overlay it to any other part of the sample.
- Zoom into a marked area for a more detailed view of the waveform.
- Ability to read Atari ST discs to obtain and convert samples to Archimedes format.
- Convert Amiga samples to Archimedes format also.
- Convert the sample to a module to be used as a voice in other programs.
- Midi options allow the playing of samples using a MIDI keyboard.
- Interactive control of sample and replay rates.
- Sample sizes on a 310 can be up to 26 seconds at 20 kHz, 52 seconds at 10 kHz. Direct control of the sample rate from 8 kHz to 90 kHz giving 66 and 5 seconds respectively for the sample limits.
- Maximum sample size on a 440 at 8 kHz of 457 seconds or 39 seconds at 90 kHz.
- Looping points to enable you to be creative with the sampled sounds.

Please note however the above details may alter before final releasing of Armadeus at the Acorn User Show.

Armadeus comes with 2 discs of sampled sounds worth £20 together with the program and all for £79.95. **A**

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RISC-OS Hints & Tips

• **Backup/reformatting** – If you backup a D-formatted disc to an E-formatted disc then the computer re-formats the backup disc to D-format! Similarly backing up E to D re-formats the D to E-format. Is there any way to convert to E-format other than the long-winded approach of using the copy facilities?

Beware that if you have two floppy drives configured then Backup from the Desktop assumes that you wish to backup up to the disc in the other drive.

• **Beebug's BBC-Arc file transfer programs** versions 1.4 and earlier will not work properly under RISC-OS. They say that they will up-date the software for a £3 handling charge. However, they also point out that as long as you change the boot file so that it does not load the serial fix, it will actually work although it doesn't update the screen icons so it looks as if it is not working even when it is.

• **Boot files** – !BOOT files built under Arthur 1.20 can be easily modified to run from both the Desktop and the Supervisor by minor modification and alteration of the filetype to command e.g.

Arthur 1.20 becomes RISC-OS

```
*BU. !BOOT          *BU. !BOOT
*RMLOAD RAM_BASIC RMFASTER BASIC
*BASIC              myfile
CHAIN "myfile"      <Escape>
<Escape>           *SETTYPE !BOOT &FFE
```

• **Cheat it Again, Archie** – To get this working under RISC-OS, you need to be sure the DRIVE is configured to zero, then use <shift-break> to run it and do not use the mouse.

• **Clares software** – Some folk have been experiencing problems with getting some of the software from Clares Micros (notably Artisan and Alphabase) working under RISC-OS, even with the help provided on the Support Disc. If you are having problems, Clares will up-date your disc for you for a handling charge of £3 per disc (inclusive). Just send the original disc(s) and a cheque direct to Clares Micros.

• **Disc conversion to E-format** – As part of my conversion to RISC-OS, I systematically converted all my D-format diskettes to the new E-format and

experienced severe formatting errors on the reused diskettes (mostly error 08, but sometimes error 10). These were all relieved by bulk-erasing the D-format diskettes before reformatting them. I don't know the explanation for this but I guess there might be subtle timing differences between the two operating systems that could be causing slight variations in seek positioning. Ken Robbins.

• **!Draw** – If the 'group' facility is used in DRAW on a number of objects that were constructed with grid lock off, subsequent use of 'snap to grid' applies to the front object in the group only.

• **Faster than RMFASTER?** – If BASIC has been loaded into RAM using RMFASTER then a subsequent re-issue of this command will give an error report 'Module not in ROM (Error &105)'. Don't panic! RISC-OS is politely telling you that it has already been done.

• **File Type Sprites** – The file !Sprites in an 'application directory' can not only define a sprite to represent the directory, but can also define a sprite to represent a particular file type. If a sprite is defined with the name "file_xxx" (Where xxx is the three digit file type number) it will be displayed on screen whenever that file type is encountered. This sprite must be held in the file !Sprites. Normally, when an unrecognised file type is encountered RISC-OS will display a simple white box.

• **Printer hang-ups** – It appears that BASIC, running under RISC-OS, behaves similarly to BASIC under Arthur with respect to a de-selected printer, i.e. it hangs up and does not respond to the printer select button! At the Which Computer? Show I was told by Acorn that this had been fixed. I don't think so. There is however a difference. Under Arthur, only a small amount of data needed to be sent to the printer before the machine hung up. Under RISC-OS considerably more 'goes down' before it hangs up. The machine will respond powering up the printer with a loss of some of the leading print data. If <escape> is selected, it will also respond, but all transmitted data is lost. Unless anyone can offer a solution, simply make sure that the printer is selected before data is transmitted to it. B R Wilson.

• **ROM/RAM podule** – For anyone who has a ROM/RAM Podule and RISC-OS and wants to have their Alarms on the Icon Bar when they switch on. The way to do it is as follows:

1. Copy !Alarm onto Rfs.
2. Make an OBEY file called !boot on the Rfs as follows:
 - a) Any User Configurations
 - b) Last Command should read
DeskTop *RFS:!Alarm.!Run
3. Configure BOOT
4. Configure FILESYSTEM RFS.

This is documented in the User Guide on page 391.

• **Shareware Discs** – Whilst some of the later Shareware Discs have been put together using RISC-OS, there can be no guarantee that the individual programs actually work under RISC-OS. If you want to get the music files on Sharewares 5 and 11 to work under the new !Maestro, you will need to do a *SETTYPE filename &AF1 on each of the files. (Loading them and re-saving them with the new Maestro does the same thing, though one reader found that the music got corrupted unless the score was cleared first.) Even so, there are some files that are too long to work under new Maestro since, even in a 440, it will only allocate a maximum of 640k to itself. You will find with the music files longer than about 20k (and the longest on S/W11 is 43k!) that as the program tries to unpack it, it runs out of memory. Does anyone know a way round this other than using the old Maestro? (which runs under RISC-OS, by the way.)

• **Task startup technicalities** – If you want to start a 'TASK' from an already running application, you cannot simply use a * command on the application directory. Well you can but you will find your application will then close itself down. This is because the Wimp Manager wants to create a new 'domain' for any new tasks. To get round this there is a special operating system command, simply use:

```
SYS "Wimp_StartTask",block%
```

where block% is a pointer to the * command. Alternatively you can use:

```
*WimpTask <*command>
```

which may seem a bit more familiar.

For those of you who haven't yet got around to writing your own DTP package(!), it is possible to experiment with the New Task option from the Task Manager menu. It is here that I come on to something of more relevance, which is the use of "Run" in starting applications, and this concerns the writing of Obey files.

Firstly go into the desktop and allocate yourself some RamDrive. This will serve just as another filing system to enable me to demonstrate my point. Ensure that the current filing system is ADFS, to check this enter:

```
<fl2>adfs <return> <return>
```

Select a disc with an appropriate application, I suggest the Editor, i.e. !Edit. Click on the floppy icon so as to open the filer window. Click <menu> on the Task Manager's 'big A' icon and move over to the New task option. Enter into the writable icon:

```
adfs::<disc-name>.$.!Edit<return>
```

Substitute the appropriate disc-name from the window title.

Now change the current filing system to the RamDrive,

```
<fl2>ram <return> <return>
```

Click <menu> on the editor icon on the icon bar and create a task window. An error message will occur, because it has wanted to load a module from the disc, but can no longer find it. Why is this?

There are some important lessons here regarding the way RISC-OS and the desktop finds files. All files, and by this I mean all files absolutely **everywhere**, including the ones on discs not in the drive!, have a **unique** filename, as long as the disc has a unique disc-name. Discs now have names, rather than drives having numbers. The full path-name of a file looks like this:

```
<fs>::<disc-name>.$.<dir>.  
<dir>...<leaf-name>
```

where <fs> is the filing system, <disc-name> is the name of the disc, <dir> is a directory name and <leaf-name> is what you might think of as the final file name.

So when the desktop requires a file which it 'knows' about, it knows exactly where to get it, even if it's

not in the drive and it can request that you change discs, quite by itself. When an application directory is 'Run', the full path-name of that application is read into a system variable called <Obey\$Dir>. This can be used in the !Run obey file to *Set system variables used by the application, so that it knows where to get its resource files. Because they are specified by a full path-name, there is no longer any real concept of a current filing system or a current directory, you should not rely on either being set and avoid thinking in this way! So where did the Editor go wrong? Well if you now type:

```
<f12>show <return>
```

then we get a list of all the currently set system variables and you will note that <Obey\$Dir> says :<disc-name>.\$.!Edit, so what ever happened to the filing system?

Since this was not specified in the system variable, it had to assume the current filing system, which we changed to the RamDrive. So, naturally, it couldn't find what it wanted. The reason the filing system wasn't there is because the application was started as a straight *command rather than using *Run. In this case, to quote Acorn, "the file can start with a <fs>: which (when it starts as a command) is treated as a 'temporary current fs' rather than part of the filename." So the moral of the story is, if you want to start up an application use:

```
*Run <fs>::<disc-name>.$.<dir>.  
                                <leaf-name>
```

– use this in Obey files or from within a desktop application:

```
*WimpTask Run <fs>::<disc-name>.  
$ .<dir>.<leaf-name>
```

To try this, 'Quit' the Editor and use the New task icon again, this time typing:

```
Run adfs::<disc-name>.$.!Edit  
<return>  
check <Obey$Dir> with: <f12>show  
<return>
```

This should now have the fs included, and so !Edit can find all its resources.

• **Getting First Word Plus to work in Mode 20 under RISC-OS** – The problem that you will find without this fix is that the text is of double height,

but at Mode 20 line spacing, so that it is completely unintelligible.

The benefit you get from this is that up to 60 odd lines of text are shown on the screen at one time. This worked with no trouble under Arthur.

1) First Word Plus cannot be started successfully (in my experience) into Mode 20 by a <shift-break>. You must start it from within the desktop.

2) Ensure that the desktop screen mode is 20 when First Word Plus is started. This can be done in one of two ways: (a) "Configure Wimpmode 20" (and then <ctrl-break>). (b) Amend the desktop mode to 20, using the palette icon when on the desktop.

3) Add one line to the file \$.!1stWord+.!Run. This must be done using the Editor found on the Application Disc 1. Add the line below beginning with "echo". This line sets the text height to be 8 pixels when in graphic mode. The following is the complete contents of this !Run file:

```
!Run for !1stword+ version 0.01  
IconSprites <Obey$Dir>.!Sprites  
WimpSlot -min 400K  
set FirstWordPlus$Resources $.  
                                Resources.lwp.  
set FirstWordPlus$Docs .lwp.  
echo <5><23><17><7><6><8><0><8><0>  
                                <0><0><0><0>  
run "<FirstWordPlus$Resources>lwp"
```

4) The only problem remaining with this is that any warning or information text in boxes is placed at the top of the box, sometimes with the box line running through it. This is merely a cosmetic problem and does not affect the rest of the word processor's operations. (There is probably a way round it by resetting the graphics origin or where text is printed when in VDU 5 mode.)

• **First Word Plus and RISC-OS** – Three points I've noted while using FWP under RISC-OS:

• **Getting First Word Plus started** – If you convert First Word Plus using the method supplied on the Support Disc, it assumes it is running from the "current drive". This idea is not used by the desktop, so the program starts to boot but then fails

to find the Resource directory if the FWP disc is not in the currently selected drive. Should this occur, it can be easily overcome by pressing <f12> to gain the * prompt and *MOUNT <drive number> the appropriate drive or by selecting it as the current drive with *DRIVE <drive number>.

This is only likely to be a problem for people who have more than one floppy drive, but could be disconcerting when it first occurs as the Resource directory is clearly visible on the desktop, yet the ads cannot find it. This problem occurs because the FWP boot file sets its path variables starting with \$. i.e. assuming current filing system, disc and directory.

An additional effect of all this is that it is possible for the statistics function to display the free space on the wrong drive and, although the display does indicate which drive it is considering, it never used to need changing and again could be misleading initially.

• **Old palettes, please** – First Word Plus expects the palette file to be of the old type i.e. without the VDU 19 control codes in it. Also the menu highlight colour is interpreted differently (due to changes in the WIMP it correctly inverts the colours whatever they are). The problem for people who like a different palette to the original (apart from the horrendous allocation of the same colour to totally separate parts of the window/menus – just try defining it to print light text on a dark background for example), is to remove the unwanted control codes. One method is to use Edit as follows.

- 1) Define the palette as required
- 2) "Save" the palette file by dragging the icon onto the Edit icon on the iconbar. This causes an Edit window to appear with the contents of the palette file.
- 3) Move to the FIND submenu of Edit and, ensuring that "magic characters" are switched on... Replace \x13\.\. With (i.e. nothing)
- 4) Click on Go
- 5) When the Found window appears, click on End of File Replace.
- 6) Save the amended file to disc. This will be an old format file

What the find and replace does is to search for the character with the ASCII code &13 (19 decimal) and to replace it and the next two characters (\. matches any single character) with nothing i.e. deleting the control codes.

• **Menu trees** – Under RISC-OS if you press <escape>, the menu tree is cancelled. However with First Word Plus, although the menu tree disappears, the program apparently locks up, i.e. you can't type since it does recognise this method of menu cancellation. Clicking any of the mouse buttons will however allow normal continuation of the program. **A**

Small Ad's

• **Archimedes 305** with 1Mb RAM & RISC-OS, £750. IFEL 4 slot backplane £40. Phone Chesterfield 270730 after 6pm.

• **Archimedes 310** with Computerware 4-slot backplane, £750. Colour monitor, if reqd, £150. Stephen Wright, 0272-871073 evenings.

• **Archimedes 310** with RISC-OS and manuals, Graphic Writer, Games and other discs. £800 o.n.o. Call Peter Meulman on 0482 28631 x 335, after hours.

• **Archimedes 310 Entry**, RISC-OS as new, £750. Ring Neil on (051)531 7140

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• **Clare's Artisan** plus Artisan support disc – offers in excess of £20 – money to go to charity. Graphicwriter – ditto in excess of £10. Contact Archive office. 0603-507057.

• **Clare's Artisan** £18 post paid. Phone 0442 53571 daytime.

• **First Word Plus** £60, First Fonts £15, System Delta Plus £45, SDP Reference Manual £20. Will send post free to European destination. Bob Pylyser, Hagenbroeksesteenweg 125, 2500 LIER, Belgium. **A**

BBC Acorn User Show

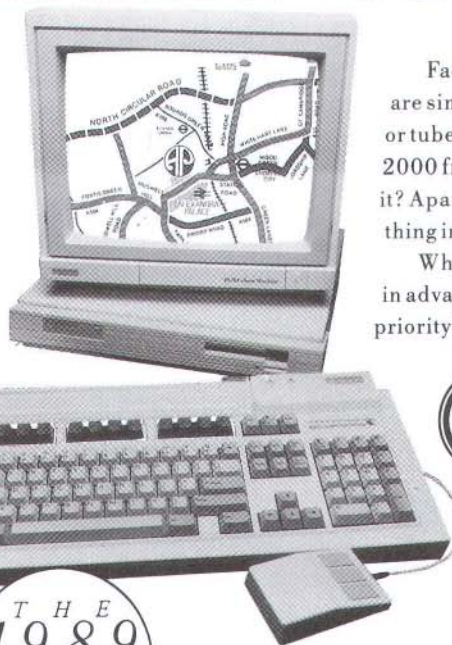
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Render-Bender – Ray-Tracing and Animation

Malcolm Banthorpe

If you set out to display a three-dimensional object on a flat computer screen, a number of different approaches are possible. Some are fast enough to allow short real-time animation sequences to be generated on a machine like the Archimedes. So why bother with an approach that takes minutes or even hours to generate a single full-screen image? If you're familiar with methods of rendering three-dimensional images, you probably already know the answer and may wish to skip the next few paragraphs to get on to the review.

Displaying 3-D images

The decision as to which method is used in a given situation will depend, amongst other things, on the degree of realism and the speed of generation required. In general, the greater the degree of realism displayed, the longer the screen will take to generate. As the screen has only two dimensions, the primary task is to adequately simulate the appearance of three dimensions.

At the simplest level this means applying a perspective transformation to the three-dimensional coordinates of the vertices of the object to generate pairs of two-dimensional coordinates. Lines can then be drawn between the appropriate points to represent the edges of the object. This approach gives the familiar wire-frame representation which, while having the advantage of being simple to implement, gives rather unsatisfactory results for all but the simplest of objects. Even then, the view is often ambiguous because you can still see the edges which should be hidden behind the surfaces that are closest to the viewer.

The next approach then, is to plot surfaces rather than edges, using the same transformed vertex coordinates. If you sort the surfaces into the order of their distance from the viewer and plot the furthest first, the correct surfaces should eventually be displayed. Those surfaces which are closest to the viewer and consequently plotted last will, where appropriate, wholly or partially obscure those further away which have been plotted earlier. This method is known as "the painter's algorithm"

because of the way that it emulates the action of an oil painter in rendering distant objects first, to be partially obscured by closer objects painted over them later.

Again, the implementation is fairly straightforward and is often all that is required to achieve a satisfactory rendering. It is likely though that, as the scene becomes more complex, a lot of time will be wasted processing surfaces that will not eventually be seen. Those surfaces which face away from the viewer should never be seen anyway. So the next stage is to apply a process called "back surface culling" before the painters' algorithm is brought into action. By determining which surfaces face away from the viewer, they can be eliminated from the list before the sort is applied.

Even so, the scene will not necessarily be rendered correctly in all circumstances. Intersecting surfaces will be dealt with incorrectly. The last surface plotted of a pair that intersect will be seen, rather than parts of both. A possible solution is to subdivide the surfaces into smaller ones which do not intersect.

The next stage of sophistication is to use a z-buffer algorithm which, instead of examining whole surfaces, looks at each pixel plotted on each surface. This allows the surfaces to be plotted in any order and so eliminates the need for sorting. As the first surface is plotted, a record is kept in the z-buffer of the distance of each pixel from the viewer. When subsequent surfaces are processed, again pixel by pixel, if there is already a pixel at that screen address then the depth of the pixel, as stored in the buffer, is compared with the pixel on the new surface. If it is closer to the viewer it is plotted, otherwise it is ignored. Obviously a lot more processing is involved with this method and a large buffer is required: at least one byte for each pixel on the screen and preferably more.

Further improvements to the above methods have been developed and if you would like to pursue the subject further, one of the standard text books on computer graphics, such as "Fundamentals of Interactive Computer Graphics" by J. D. Foley & A.

Van Dam published by Addison Wesley, should help to satisfy your curiosity.

Lighting effects – Ray-tracing

Still to be considered in connection with the realism of three dimensional displays is the question of lighting. All of the above surface algorithms can be supplemented to deal with the light reflected from a surface, but when it comes to dealing with shadows, transparency and mirror reflections it becomes impossible, using the above methods, to account for every possible contingency.

This is where ray-tracing comes in. What we actually see when we look at a scene in the real world is the rays of light, from one or more sources of illumination, after they have been reflected from the surface of an object to the eye or from surface to surface before reaching the eye. The rays may also be refracted (bent) as they pass through transparent or partially transparent objects.

In trying to construct realistic images on the screen, the ideal approach would be to imitate this process precisely. So what we're aiming for is to consider all the rays of light from each source, to follow their paths as they are reflected and refracted by objects in the scene and to plot the sum of the values (colours) of the rays reaching each pixel on the screen.

The problem is that there are an infinite number of rays leaving each source of illumination and most of them will never end up at the viewpoint. So the suggestion would seem, at first glance, to be a non-starter. The solution is to consider the situation in reverse: start at the viewpoint and trace the rays back through each pixel on the screen via reflection and refraction to each source of illumination.

When a ray of light hits a surface it may be affected in any of three ways:

- 1) **Specular reflection** as a shiny surface. Depending on the surface, part of the scene may be reflected in the surface, as a mirror or a polished metallic surface, or just highlights of the illumination may be visible as glossy paint.
- 2) **Diffuse reflection**, as a dull or matte surface.
- 3) **Refraction** through a transparent substance such as glass.

Most objects will exhibit a combination of 1) and 2); some will exhibit all three. Ray-tracing can deal with 1) and 3) but cannot fully cope with 2). This is

because when a light ray hits a matte surface it is diffused into an infinite number of directions, many of which could then be reflected by other objects. Hence the ray would have to be traced back from the viewpoint along an impracticably large number of paths. In practice, only other objects that are very close will be noticeably affected by diffuse reflection from a surface. By taking into account only those rays of light which are reflected from the surface back to the viewpoint, the effect is correct most of the time.

Are micros fast enough?

It's probably already apparent why ray-tracing should be such a time-consuming process: consider the fact that there are 163840 pixels in a mode 15 screen. There may be multiple light sources and as the number of objects in the scene increases, the number of possible reflection/refraction paths also rapidly increases.

There is as yet, as far as I know, no such thing as the generation of animated ray-traced images in real-time. It could happen one day, though, because ray-tracing is an ideal candidate for parallel processing. Each pixel can be considered independently from the rest and could in theory be dealt with by its own processor. Until recently ray-tracing hasn't really been a job to tackle on a micro-computer at all, unless you were prepared to wait hours or even days for a result. In addition, good spatial and colour resolution is necessary to take advantage of the high degree of realism that ray-tracing can offer.

Archimedes unbeatable?

You may have seen some fairly impressive Amiga ray-traced demonstration screens. Archimedes can do at least as well and somewhat more quickly. You may also have seen some examples of what the Archimedes can do on Clares Graphics and Animation discs. It is claimed that the software reviewed below is faster than similar Amiga and Atari ST packages by a factor of at least five and by as much as 10 or 12 times in some circumstances. Ray tracing is sort of application where the graphics and processing power of the Archimedes are probably unbeatable this side of about £12,000.

Render Bender

Render Bender from Clares is the first substantial application of ray-tracing on the Archimedes. There have been a few small magazine and public

domain examples but nothing that would allow anyone to construct their own scenes without first acquiring an in-depth knowledge of the subject.

The software comes on two discs and is accompanied by a 72 page manual. As usual, Clares have put a lot of effort into getting the user interface right and the result is a pleasure to use once the basic principles of operation have been grasped. This is one case where, however friendly the software, it is essential to read the manual first.

The approach adopted to create a picture is, unusually for a graphics package, to first create a text file containing a description of the scene. This makes good sense once you take into consideration that for a scene to be ray-traced, it must be defined in terms of certain primitive shapes such as spheres, cubes and cylinders. In all, 11 different primitive shapes are available and a screen showing all but the sphere may be viewed, as a reminder, at any time while you are composing the scene description.

A rather basic but adequate text editor is provided as part of the programming environment. By constructing a scene as a text file rather than by drawing, it is a simple matter to define objects which are not visible from the viewpoint but whose reflected and refracted light may affect the appearance of visible objects. The use of a text file also allows variables to be included in a scene description so that a sequence of screens for animation can be automatically generated.

Scene description language

The scene description language is very simple and should pose no problems, even for reluctant programmers. Comments can be included as required. It does help, though, to have a minimal understanding of 3-D coordinates. If you're not familiar with them, the manual does provide some explanation and it will probably help to examine carefully the many examples of scene descriptions included on the discs. Indeed, the best way to gain familiarity with the package is to try the effect of modifying the examples supplied in various ways. They are well commented and generally easy to follow in conjunction with the manual.

To give some idea of what the scene description language looks like, a scene containing a single spotlight golden sphere might be:

```
view, 0,100,-100, at, 0,50,0
spotlight, 4,0,55,-55,0,-1,5, .65
sphere, :gold, :metal, 0,60,0, 35
```

The surfaces of an object may be given a number of attributes such as metal, glass, shiny, and bulb (effectively self-luminous and its appearance is not affected by light falling on it). A palette of 14 different colours can be assigned to objects or they may be colourless as with glass or a mirror. Coloured glass and mirrors are also possible.

The program uses 256-colour modes 12 and 15 to display scenes so that the actual colours seen can vary in brightness depending on the lighting. Good use is made of dithered colours to give the appearance of smooth shading. Up to four light sources of three possible types, beamlight, pointlight and spotlight, can be included in a scene. The intensity of each source can be specified and one type (spot-light) has a variable beam width. Render Bender is capable of processing reflections to a depth of 20 levels. That means that, where there are opposing mirror surfaces, there could be up to 20 reflections of reflections of reflections etc.

Once completed, the text file can be saved to disc for future use. In creating a new scene, it will often be quicker to modify an old file than to create a new one from scratch. Prior to actually generating the scene, the description file is first compiled into an intermediate code to be used by the ray-tracing software. At this stage if any syntax or other errors in the description are detected you will be taken back into the text editor at the offending line. Finally, a number of global attributes for the scene may be set. These include sky colour and depth, the degree of opacity and the refractive index (a measure of how much the light will be bent) of transparent objects, floor colour and pattern, and so on.

Time and picture size

The time taken to generate a scene can vary from less than a minute to an hour or more, depending on the number of objects in the scene, the number of light sources and the number of possible reflection and refraction paths. To get some idea of what a scene will look like, without too much delay, there is an option to generate a small version of the picture at 1/4, 1/16, 1/64, 1/256 or 1/1024 of full screen size. If, say, 1/4 size is chosen, there are only a quarter of the number of pixels to be considered and the image is completed in a correspondingly shorter time.

This will allow, for instance, the positions of objects to be modified without first having to generate the full screen to see what changes are necessary. 1/16 size is probably the most useful in this context but 1/64 or even 1/1024 size can often still give some idea of how the scene will look. The screen display may be disabled during generation to free some processor time and add a bit more speed. Similarly, it is possible to specify that no shadows will be shown, which also has a speed advantage. Images are normally saved to disc in compressed form but may be converted to the normal screensave format for use by other programs.

Delta Animator

The other half of the package is called the Delta Animator and allows short animated sequences, which can be highly effective with ray-traced pictures, to be saved in a highly compact form and to be replayed. The scene description language has provision to generate a sequence of screens with a prescribed movement of objects within the scene. Up to 26 variables can be used to describe how objects will move in position or rotate. Modifying some of the examples supplied with the package is again probably the best way to get familiar with this aspect of the language.

Once a sequence of frames has been generated and stored, the job of the Delta Animator is to further compact the files so that it can be replayed in real time. Having stored the first frame, which will normally already be in compressed form, the Animator then stores only the differences between subsequent frames. A sequence of up to 99 frames may be stored in this way and may have initially been generated on more than one disc.

The number of delta compressed frames that will fit on a single floppy disc will depend on how much the scene changes from one frame to the next; that is, how much movement there is within the scene. One of the sample animations on the disc has changes over about two thirds of the screen but it nevertheless compacts from 1.6 Mbytes down to 428k.

Animation generation

The process of generating the the screens in the first place can obviously be fairly time-consuming and is possibly the sort of thing to leave running overnight. Subsequent viewing could be a

stimulating alternative to breakfast television. To get some idea of what an animation will look like, the reduced screen sizes can be used. The use of smaller screens will also allow the generation of longer sequences as more frames can be accommodated on a single disc.

Delta Animator works with compressed Render Bender screens or with standard modes 12 or 15 screens. It is therefore possible to use other art packages to add images or text to ray-traced screens before processing them into an animated sequence. Similarly, an art package such as Artisan could be the sole source of a sequence.

Conclusion

Clares are to be congratulated in making available to Archimedes users a form of computer graphics which, until recently, was confined to mainframe computers with or without dedicated hardware. As mentioned earlier, it does help to know a little about three-dimensional geometry, but lack of such knowledge need not be a deterrent if you're keen to explore ray-tracing.

The results have a degree of photographic realism which is unobtainable using other methods of 3D picture rendering. However, a note of caution may be appropriate here. It's not particularly easy to depict in the "photographs" a large proportion of the objects encountered in everyday life. In theory almost any shape can be built up using the primitive shapes available and the scene description text file can be up to 32k long. In practice, I feel that most people will content themselves with creating pictures featuring more strictly geometric objects such as shiny spheres and glass cones.

This is not a criticism of Render Bender but a statement of the present limitations of ray-tracing with the level of processing power available to us. So if you aim to use your computer to plan and visualize the interior of your home, you would be better off with a 3D package such as Euclid. But if you want to experiment somewhere closer to the leading edge of realism in computer graphics then Render Bender is an excellent introduction to ray tracing and makes full use of the Archimedes' graphics and processing power to give you a set of tools to create some stunning pictures and animations. **A**

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TimeWatch can also search for a piece of text in any, or all, of your categories of information; print some, or all, of the information stored in a range of pages; and, by means of the perpetual calendar, move quickly from one page to another.

For those who have made use of the Arthur 1.2 DeskTop Diary, TimeWatch will import the contents of the diary files.

DiscTree



provides comprehensive, and easy to use, facilities to display the directory structure of a disc, search for files and backup files.

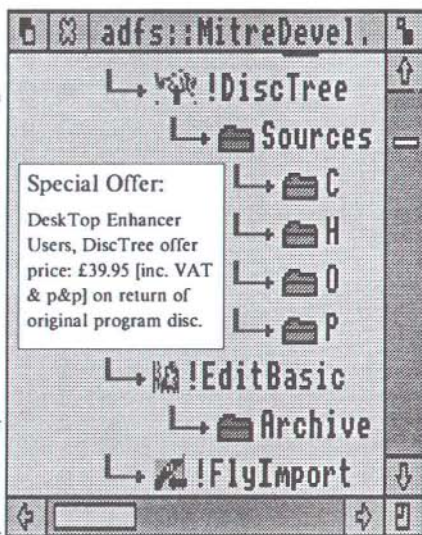
A TreeViewer provides the means to move rapidly around the directory structure of a disc and search for files. After specifying the directories to search, name and type to match the files found will be displayed, ready for loading into an editor.



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Prices: DiscTree: £49.95. TimeWatch: £29.95 [inc. VAT and p&p].

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Hardware Column

Brian Cowan

Tracker ball progress

Last month I reported on my efforts at installing a tracker ball on my Archimedes. Now I can let you know how I have been getting on with it. In one word: super! It has made life so much easier that I can't think why I did not do it ages ago. The main problem I had was with "dragging" things around the screen, but I have perfected the technique of pressing the button with my middle finger and moving the ball with my thumb.

I am sure it is best to leave the middle, larger button as "select", using the left one for "menu". You soon get used to this, and your fingers automatically find the larger central button. You remember that there was a small problem with ARC-PCB which showed the mouse button positions on the screen. Well it is a simple matter to edit the program to swap the two displays over. I have not tried any drawing packages yet but I will report on them when I do.

As I am using a total of five Archimedes machines at home and at work we shall be needing a few more tracker balls. I am investigating balls other than the Marconi one and I plan on trying a few. I must say, I particularly like the tracker ball used on the Apricot Xen computers; this has the central button on the top of the case and the left and right ones are mounted on the sides of the case. This is an ergonomically-sound design. Also the case is somewhat smaller. The Marconi ball unit is certainly quite a chunk of plastic to sit next to your keyboard.

MEMC update

I have been trying to get to the bottom of a number of rumours and claims which are related to the MEMC chips in the Archimedes machines.

One review of the R140 Unix machine stated that it was an ordinary 440 but with a faster MEMC chip (and of course the larger Winchester and modified backplane). And then we heard that the new 410 and 420 models as well as the yet to be released new 440 machines all run "a little faster" than the old models. Figures between ten percent and twenty five percent have been quoted.

Connected with all this (you will see why in a moment) one reader wrote to me asking about the

PAL chip he found in his 310 sitting somewhere close to the MEMC chip and the 1 Mbyte of RAM. His inference was that maybe changing the PAL would permit expansion to 4 Mbyte by simply changing the RAM chips. Unfortunately this is not the case since, as has been discussed previously, the 300 boards and those of the 440 are quite different.

It turns out that the original MEMC1 chips do not work quite properly with the production version of the ARM chip ARM2. For this reason the PAL is used to sort out the problems and the result is that some operations take more clock cycles than they really ought. This is mainly a problem with multiply operations, but it also slows down load operations and coprocessor accesses.

The new machines, including the A3000, have a new MEMC chip called MEMC1a and this has sorted out most of the problems. This is the reason why these machines run that bit faster. The problems are not completely fixed, however, and for coprocessor applications a small PAL patch is still required. Clearly this does not apply to the A3000 machines, which do not support coprocessors.

And now ARM3

The latest ARM chip is the ARM3. This has some twelve times as many transistors as the ARM2. Most of these extra transistors constitute a fast RAM cache. Unfortunately there is still no floating point support which I would have thought was an obvious development. The chip runs at 24 MHz but, unfortunately, it is not pin for pin compatible with the ARM2. Luckily one company, Aleph One, are planning an ARM3 upgrade board for present machines at a projected price of "a few hundred pounds". (*I heard £599. Ed.*) Rumour has it that RISC-OS and some applications have been written to utilise the designated RAM cache area. So far this is only speculation: I have been unable to obtain confirmation. Watch this column.

One disadvantage of using the ARM3 upgrade is that it will not then be possible to use the coprocessor board (if it ever appears!) because the bus structure is different on the ARM3.

Once again I am indebted to Mike Harrison for his useful help and information. **A**

Eureka! Bulletin Board Reports

Eureka 1 Report

Eureka 1 is now exactly one year old (give or take a few days). We've had our fair share of troubles with the system but we've had an amazing response over the year from all the Archive subscribers who call the system and a great number of Beeb owners who are going to up-grade to the wonder-machine.

Eureka has now earned the image of being a little on the unpredictable side. From the start it has consumed two BBC Masters, one BBC B, two Amcom hard drives, a Pace Linnet and one sysop and at the moment we're still waiting from Amcom to return the hard-drive after it has been repaired and re-calibrated!

The system itself has expanded gradually and in terms of content it is now at its prime. The Archive area on the system is being re-vamped and the rest of the system is being shuffled around. We're now moving over to much more reliable software known as XFS (Xtra Flexible System) which should prove more useful than the ACMB which we used previously. We're now running on a BBC Master and Demon II modem along with the Amcom 20 Mbyte hard drive, which has proved to be a bit feeble at times.

A great number of people may find the system a bit difficult to use at times. This may be due to the software or even just me. This is why I have written a Eureka User Manual, which is available at only £5.00 from me at the following address :

Carl Wright, 10 Gould Road, Norwich, NR2 3QH.

Enclose your cheque or postal order for £5.00 made payable to Carl Wright and I'll send you your copy of the manual by first class post the following day. The manual contains detailed information about how to use the message areas, where everything is and what all the on-line utilities do.

Some people have found it difficult getting onto the system using the WS3000 modem, we think we've solved this problem now. Thanks to Pilton Community College via Prestel for telling me that 'some WS3000's don't reset all of their AT commands to factory settings on ATZ. If you go

through and reset them all manually then it should work OK'. If your problems still persist after this, let me know via Eureka II or at the contact points mentioned at the bottom of this column.

We are in desperate need of specialist editors to run their own sections on the system, especially the Archimedes orientated areas, as I don't have easy access to an Archimedes so I don't have the foggiest where to start in an area like this. Any contributions to the system are always welcomed by the editors of the area concerned! So give it a bash!

There is hopefully going to be a much wider selection of Archimedes downloads available soon, thanks to Paul Wickham who will be running this section. If you are going to the Acorn User Show on Sunday 23rd July then I'm afraid you may bump into me and everyone else who contributes to the system - remember to say hello!

If you have difficulties getting onto the system, contact me at one of the following points:

Prestel : 603505971

BT Gold : 74:MIK2380

Telex : 934999

TXLINK G (Ref 603505971)


Voice: (0603) 505971 (Evenings + Weekends)

Carl Wright (Eureka I Sysop)

Eureka 2 Report

Eureka 2, apart from packing up in disgust when Alan went off for a week's holiday, is going well, heading for 5,000 calls and rapidly becoming the most used centre for information interchange about Archimedes matters. We are hoping to implement three phone lines as soon as possible to ease the congestion. To do this, we will have to buy a 440 and a 47Mbyte drive plus an Intelligent interfaces dual RS423 podule plus a couple of new modems, but Paul says that as long as you carry on supporting Archive by buying your software and hardware from him, he will be able to sponsor it! (*I said that?* Ed.)

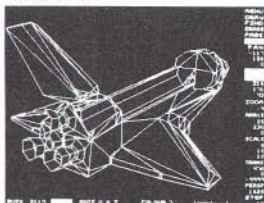
This month's registration word is BEEHIVE.

Alan Glover (Eureka II Sysop) 

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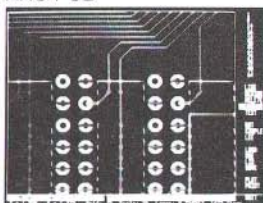
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£195.00 (ARC) New

RiscBASIC

Supercharge your Archimedes Basic programs by compiling them automatically into pure ARM Risc code with the RiscBASIC compiler. Features include Relocatable modules, Cross reference of all variables, functions, and procedures. Floating point and Integer support. Stand alone code generator. Optimising compiler & Full runtime error handler.

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£99.95 (ARC) New

RiscBASIC – Silicon Vision's Compiler

Brian Cowan

The way that BBC BASIC has evolved makes it a rather difficult language to compile. Not only are there the mathematical facilities to implement, but there are the graphics features, the in-line assembler and of course the (un-compileable?) EVAL function. Some of the old 6502 BBC hands may remember a BASIC compiler for that machine which was close to useless. In the December 1988 issue of Archive I reviewed the first-released BASIC compiler for the Archimedes, which was produced by Dabs Press. It was a welcome surprise to me to see how good their Archimedes Basic Compiler (ABC) was. It showed what could be done and it set the standards by which other products would be judged.

BASIC features

The interpreter provided with the Archimedes machines is for BBC BASIC V. Version 1.02 was provided with Arthur 1.2 and version 1.04 comes with RISC-OS. Ideally a BASIC compiler should be fully compatible with the BASIC interpreter on ones machine. ABC fell short of this in a number of areas, which I covered in my review. ABC version two was an improvement (Archive February 1989) but there remained areas of incompatibility with BASIC V. In particular, I was concerned with the sophisticated array handling features of BASIC V and the passing of data objects to and from procedures which were not implemented in ABC.

Another compiler

Now we have RiscBASIC and new ground has been broken again. The claim from Silicon Vision is that "anything compilable in BASIC V we can compile". This is some claim! How is it borne out in practice? Read on...

Directory structure

To get started, all you need to know is the default directory structure of the compiler disc. The root directory contains subdirectories called B and O. The B directory contains BASIC programs and following compilation the O directory contains the object code, the compiled version of the program. By default, the object code file has the same name as the BASIC source code file.

Calculating π

I started with my old favourite program, J.Phelan's π evaluation, although it has been speeded up a little since my ABC review. The current version of the program running with interpreted BASIC V takes 192 seconds to produce 1000 digits of π , while the ABC compiled code takes 41 seconds. Compiling this program with RiscBASIC it runs in 24 seconds. This was a welcome improvement. However by compiling with RiscBASIC using the Turbo facility, the π program generated one thousand digits in a staggering 14 seconds!

Turbo mode

The Turbo mode is provided for properly structured programs where loops have only one entry and one exit point. It produces code which runs much faster since there are fewer branches and less tests to be made during execution. ABC version one only works with such structured programs, although version two has lifted this restriction.

Benchmarks

I ran through some of the standard benchmark tests comparing the interpreted programs with those compiled under ABC version two and RiscBASIC. For consistency, all floating point variables are single precision in the compiled programs and the escape key is enabled.

	Inter- preted secs	ABC V 2 secs	Risc BASIC secs
Ackerman	5.13	0.33	0.17
Fibonacci	9.72	1.49	0.14
Grafsrn	1.84	1.05	0.88
Textsrn	2.60	2.38	2.24
Realthath	0.27	0.30	0.27
Triglog	1.77	3.49	3.44
Intmath	1.95	0.39	0.17
Sieve (1651 primes)	5.76	0.60	0.07
Loops			
Repeat...Until(100,000)	13.16	1.88	0.10
While.....(100,000)	15.29	1.86	0.12
For.....Next(1,000,000)	22.30	3.10	1.34

I should make a few comments about these tests. I don't think that they should be taken too seriously because all they show is how fast the programs run the benchmark tests! Compilers may be written to run a set of benchmark tests fast, but what is important is how real life programs run. I have quoted times for the π program and I will give others below. Another point is that my results are slightly longer than some published figures. I think that this is because my machines have the older version of the MEMC rather than the newer, slightly faster, one.

Floating point

It is quite clear that RiscBASIC is faster than ABC in all tests, and substantially faster in most. The trig-log program runs slower than interpreted BASIC and Realmath runs as fast. There is difficulty with floating point operations because the compilers have to use the floating point emulator whereas the interpreter has its own highly optimised floating point routines in ROM. The compilers will run substantially faster with the floating point co-processor – we shall have to wait for this.

Fast fourier transforms

One of my current projects is involved with running fast fourier transforms. Essentially this sorts out how various sounds are made up out of pure tones. All of the tests were done on a 1024 point FFT. I ran my program using interpreted BASIC and it completed the FFT in 4.81 seconds. Using ABC, the program ran in 3.05 seconds and with RiscBASIC it took 2.37 seconds. The compilers were both running in single precision mode. In fact, this is not really adequate for accurate FFTs and some intermediate variables in the calculations ought to be in double precision. I am looking into this at the moment and also some possible ways of making the FFT run substantially faster.

Compatibility

An important difference between ABC and RiscBASIC is in the question of compatibility with interpreted BASIC V. RiscBASIC does in fact implement the full BASIC V syntax and it supports all keywords except EVAL and cases where DATA has arguments set at run time. EVAL is commonly assumed to be un-compilable, but I understand that a new version of RiscBASIC under development

will include it. ABC has a longer list of incompatibilities, as I have detailed in my earlier reviews of that product. Of particular importance is the lack of whole array manipulation facilities, most useful in graphics and mathematical applications.

Matrix facilities

I ran some tests on matrix multiplication, essentially performing $C() = A().B()$, two thousand times on 10×10 matrices with given elements. Interpreted BASIC performed 2000 such multiplications in 46.79 secs, and RiscBASIC took 154.95 secs. This was for floating point elements, the compiler working in single precision. It is clear that there is considerable overhead in calling the floating point emulator for the multiplications. I tried the same test on matrices with integer elements and there the interpreter took 11.26 seconds and RiscBASIC just beat it at 10.23 seconds. It is not surprising that there is not much difference in this case since what is being tested is not the code compiler, rather it is the library functions and these should be independent of compilation. The conclusion is that this library function in RiscBASIC is fine.

Other features

There are some rather clever features that RiscBASIC has incorporated into its compiler. The most often used integer variables are allocated to ARM registers rather than RAM for speed. Also, you can force integer variables to be stored in registers if you wish. There is a "dump" option which produces a text file detailing all variables, procedures and functions and where they are located.

I mentioned the "turbo" compiler option which, for structured programs, produces much faster code. Unfortunately there is no test available of whether the program is suitable for turbo or not. You have to compile it, whereupon a warning may be given. The "single" option provides single precision floating point operations rather than the default double precision. This can give a speed increase for floating point-intensive calculations.

The error diagnostic facilities are most useful. Whenever a compiled program crashes you can find the line number of the error in the original BASIC program. Also compilation time (apart from the disc access) is extremely fast.

Precision and integers

The current implementation of RiscBASIC does not support extended precision FP operations. The original version of ABC used only single precision, which was rather limiting. It was a welcome development that ABC version 2 supported single, double and also extended precision. Currently, RiscBASIC uses only single and double precision (which is higher than interpreted BASIC V), but I understand that later versions will include extended precision. There is a very useful feature that ABC has which is absent in RiscBASIC whereby you can test whether floating point operations are being used. This allows you to determine whether the floating point emulator / co-processor need be installed. It is not always possible to find this out by observation as some seemingly integer operations are in fact performed with floating point intermediate values.

Assembler

Part of the BASIC V language is the in-line assembler. In ABC, assembly is performed at run time, while RiscBASIC assembles at compile time. Generally, I think that compile time assembly is more appropriate, although of course an equivalent way to achieve this is to assemble the assembler code separately as external routines and to call them as required. However, I do have some applications where run time compilation is preferable! A particularly welcome feature of the RiscBASIC assembler is that it accepts all the standard floating point mnemonics. This will be very useful, although of course the BASIC source programs will not run under the BASIC interpreter!

Relocatable modules

RiscBASIC provides facilities for the production of relocatable modules. There is a range of compiler directives to control what sort of module you want, its name, help string, version number etc. Also, it is possible to produce what is called a PROCmodule. This enables a module to respond to a number of star commands. A PROCmodule is a collection of PROCs which are compiled together in a module. Each PROC may then be called by its name preceded by a star. There are examples on the program disc so that the module syntax may be studied in detail. Modules can incorporate

RiscBASIC's full range of features including floating point operations.

Code size and the library

One development in ABC version two is the provision of the library in a relocatable module. This means that the minimal size of a compiled program is some 2 kbytes rather than about 20 kbytes. As such, it does not however lead to a saving of memory space as the library module must also be installed. The real advantage is that when there are a number of compiled BASIC programs, perhaps in some multitasking application, when memory space for only one library is required. Nevertheless, I have mixed feelings about having a library module since, in certain respects, the compiled program code is not entirely stand-alone.

Documentation

The documentation consists of a 21 page manual together with a five page addendum. Once you understand the disc directory structure, however, you don't need to make much reference to the documentation to get going. This must be a tribute to the remarkable compatibility of RiscBASIC with the interpreter. But, for those who require more information, the manual is helpful, although for further enlightenment, the example programs should be studied.

Conclusion

RiscBASIC is an extremely powerful compiler. It provides the fullest compatibility with the BASIC V interpreter and its object code runs extremely fast. I have a few complaints, however:

- 1) You don't know whether Turbo mode will work or not until compilation.
- 2) If the disc is becoming full, the machine hangs up during compilation (when running under Arthur).
- 3) It lacks extended precision FP support.

Plus points in favour of the ABC compiler are the extended precision floating point and the inclusion of a fairly intelligent disassembler, although I understand that future versions of RiscBASIC are likely to include an assembler source generator.

Both compilers have their advantages, which I tabulate as:

ABC2 RiscBASIC

Speed	.
Compatibility	.
Extended precision	.
Disassembler	.

I think for most applications, RiscBASIC will have the edge. In my view, compatibility is the most important consideration, followed by speed. After

all, if speed is most important to you then you should write directly in assembler.

In summary, BASIC V is the best version of BASIC produced and RiscBASIC provides the most compatible, fastest compiler for this language. This will be an invaluable addition to every serious BASIC programmer's toolkit. My congratulations to Silicon Vision. **A**

Random Numbers and Sorting

Malcolm Rigg

I have just read the "Language Forum" by David Wild in the May 1989 Archive and it prompts me to write this article about sorts and about the random number generator that I used to test the relative performance of the various types of sort.

Sorting

I was intrigued to note in the November 1988 edition of PCW (Personal Computer World) an article entitled "Pigeon Sort" by Paul Birch, in which he claimed that this type of sort was faster than a Quicksort! Back in 1978, I wrote my first Quicksort in machine code on a mainframe computer and measured the performance improvement over a Fortran Insertion Sort as 250 times faster. Having been instantly converted to the benefits of Quicksort, I decided to test the claims of Paul Birch and test his Pigeon Sort on an Archimedes.

I transcribed the source code from the article and made a few simple editing changes like putting the comments on separate lines and renaming variables from names longer than 7 characters to names less than 7 characters. Then I coded a test routine which generated sets of random numbers and timed the sort with 1000 variables, 2000, and so on.

Random Number Generators

The random number generator I used at first was coded from an article published in the October 1988 "Communications of the ACM" entitled "Random Number Generators: Good ones are hard to find". The article gives the code of a pseudo random generator in Pascal. A version of the same code in Fortran and my coding for all the sorts is included separately on the magazine disk. The Pascal code is correct on any system for which maximum integer

size is $(2^{*}31) - 1$ or larger. Regretably I haven't yet tried it in Pascal myself.

First declare var seed: integer and then use:

```
function Random: real; (* Integer
    version *)
const
  a = 16807;
  m = 2147483647;
  q = 127773; (* m div a *)
  r = 2836; (* m mod a *)
var
  lo, hi, test: integer;
begin
  hi := seed div q;
  lo := seed mod q;
  test := a * lo - r * hi;
  if test > 0 then
    seed := test
  else
    seed := test + m;
  Random := seed / m;
end;
```

It is an extremely simple, yet good, pseudo random number generator. I have grave doubts about the value of a pseudo random generator which the author (David Wild) admits is not testably random.

The pseudo random number generator I used is a good one for a 32 bit machine and the results I got with it for the comparison of sorts were fascinating.

Results

It is true that the Pigeon Sort is linear with increase of numbers to be sorted. However, the performance I got from my own Fortran coded Quicksort will ensure that I never use the Pigeon Sort. It is far too slow for sets of numbers up to the maximum I tested on an Archimedes 440 of 100,000 values. The Quicksort was still over twice as fast as the Pigeon Sort.

For comparison, I coded the following sorts:

1. BASIC Quicksort
2. Fortran Pigeon Sort
3. Fortran Insertion Sort
4. Fortran Quicksort
5. Fortran Quicksort plus

(Quicksort plus is optimised to sort down to strings of length 9 and then finish with an Insertion sort.)

The results of a series of tests are shown below. My next move is to code the Pigeon Sort in C and re-try the comparison. I have already coded the Insertion, Bubble, Quicksort in C.

Maybe my Fortran code is better than I thought, but I certainly didn't try unduly to optimise my code, nor did I change Paul Birch's code. The comparison

of Fortran and C should be informative. Once I have the code in C it will be a comparatively simple matter to do a conversion to Pascal and make yet another comparison.

Useful References

- [1] – "Random number generators: good ones are hard to find" – Stephen Park & Keith Miller, published in the October 1988 Communications of the ACM.
- [2] – "Pigeon Sort" – Paul Birch, published in the November 1988 Personal Computer World.
- [3] – Beebug Volume 4 Number 7 – Quicksort.
- [4] – "The C Library" – Kris Jamsa (ISBN-0-07-881110-4): this book contains useful sorting code in C. **A**

Results of Tests on Archimedes

Four different sort algorithms executed on an Archimedes 440 being an Insertion sort (Isort), Pigeon sort (Psort), and two variants of a Quicksort; one with an Insertion sort for last stage efficiency (QIsort), and one without (Qsort).

*Isort coded in Fortran

variables	time (s)
1,000 –	2.25
2,000 –	8.78
3,000 –	20.05
4,000 –	34.77
5,000 –	54.85
6,000 –	77.34
7,000 –	104.92
8,000 –	138.17
9,000 –	177.30
10,000 –	219.11
11,000 –	264.98
12,000 –	312.05
13,000 –	369.32
14,000 –	427.37
15,000 –	493.63
16,000 –	563.14

*Psort coded in Fortran

1,000 –	0.41
2,000 –	0.82
3,000 –	1.23
4,000 –	1.64
5,000 –	2.06
6,000 –	2.47
7,000 –	2.86
8,000 –	3.26

9,000 – 3.67

10,000 – 4.10

11,000 – 4.50

12,000 – 4.89

13,000 – 5.34

14,000 – 5.71

15,000 – 6.15

16,000 – 6.54

50,000 – 20.46

100,000 – 41.22<–

*Qsort coded in Fortran

1,000 – 0.17

2,000 – 0.42

3,000 – 0.60

4,000 – 0.81

5,000 – 0.99

6,000 – 1.20

7,000 – 1.36

8,000 – 1.62

9,000 – 1.79

10,000 – 1.99

11,000 – 2.21

12,000 – 2.43

13,000 – 2.64

14,000 – 2.87

15,000 – 3.04

16,000 – 3.31

*QIsort coded in Fortran

1,000 – 0.10

2,000 – 0.21

3,000 – 0.35

4,000 – 0.48

5,000 – 0.61

6,000 – 0.75

7,000 – 0.90

8,000 – 1.04

9,000 – 1.17

10,000 – 1.33

11,000 – 1.49

12,000 – 1.62

13,000 – 1.76

14,000 – 1.94

15,000 – 2.10

16,000 – 2.23

50,000 – 7.49

100,000 – 15.81<–

Quicksort coded in BASIC

1,000 – 7

2,000 – 15

3,000 – 25

4,000 – 36

5,000 – 44

6,000 – 52

7,000 – 62

8,000 – 74

9,000 – 83

10,000 – 94

Language Forum

David Wild

There's even less in the column this month, for a variety of reasons. Work has been rather hectic, RISC-OS has arrived, and I have been trying to get to grips with that, and I've just received my external hard disc to add to the 20 Mbyte in my 440. (Wild's Law on hard disc space says that you need twice what you have now, plus 10 Mbytes – and it's still true when the new disk arrives!)

LISP news

I had written to Acorn asking whether there would be certain changes in future releases and was very disappointed to receive a reply saying that there is unlikely to be any further development of this product. I don't know how many people use the language, so I can't assess how bad the effect will be on the customer base. If you are a user please drop me a line so that we can put pressure on Acorn if it is appropriate. They could at least clean up the present version even if they are not going to provide anything new.

Pascal, Fortran and 'C' News

The special offer for upgrading Pascal, Fortran and 'C' has now expired and so the position, officially, is that any user with the initial version will have to pay the full price. When I glanced at the shelves in one computer shop a couple of weeks ago I noticed that the original version was still on sale. If you have bought one of these languages recently, or intend to do so, do ensure that it is release 2 that you get. If you have been given release 1 since April 1st take it back to your supplier and ask for it to be exchanged.

Language coverage

D. Lenthall of London has complained, rightly, that there has been very little coverage of 'C' in this column. The reason for this has been that I don't use it myself, and I haven't received any suitable contributions from other people. He asks particularly for a beginners' guide to 'C' aimed at people with a knowledge of the programming principles of BASIC V. Is there anyone out there who feels up to writing such a guide?

The sort of language contribution that I would like to see, apart from the guide, is about using the language, differences between the documentation and the program actually supplied and methods of getting over any shortcomings. What I don't want is short programs that do not illustrate specific points, although longer, fully tested, programs in any language will always be welcome for the monthly discs.

BASIC Compilers

Mr Lenthall also asks for an in-depth comparative review of the three BASIC compilers now on the market. This would certainly be extremely interesting, and Brian Cowan is working on it, though the Mach Technology BASIC compiler is not quite ready!

He also asks how each of these compilers compares against 'C' in terms of object size and performance. I don't think that this is really a feasible question. The problem is that if you were to re-write the same programs in another language they would actually be different programs, and there could be more differences brought in by the programmer than the compiler. A learner will, obviously, not write as good a program as someone who is experienced in the language and this would cloud the comparison again. You can compare compilers of the same language, because any good compiler should accept a "standard" program with only trivial changes such as those for attaching files.

We would all do well to remember that good program design can do a lot to increase program efficiency. In the Dabs Press book on 'C' there is a prime number algorithm which will run painfully slowly for large numbers, even in Archimedes machine code, and it is quite likely that it could be beaten by a good algorithm in ZX81 BASIC if asked to provide all the prime numbers between ten and eleven thousand. Looking for a "faster" language is sometimes a bit like buying a racing car because the journey is so slow, when a good knowledge of alternative routes might make a bicycle quicker. **A**

Holed Out – 3D Golf Game

Alan Highest

"Always read the instructions"

The game comes on a single 3.5 disc with a high quality 15-page instruction book and a reference card. Being a good boy I read the instructions before starting. This was a mistake because the instructions for the game controls are not the same on the Archimedes. Most versions use the keyboard but the Archimedes uses the mouse which is explained in the instructions you get when you boot up the disc. After reading the instructions, you are presented with a title screen and then the various options.

Hole preview mode

After selecting one of two golf courses, you may preview each hole. If you choose this option you see the chosen holes from the air and by pointing at any point on the course you are given a view to the flag from that point.

Playing modes

After quitting that option you can then select matchplay or strokeplay. Matchplay is where you play against one other player and the winner is the player who wins the most holes. If you choose strokeplay, you can have up to six players and the winner here is the player to complete the course in the least number of strokes.

Other options

You can now select the players' names. If you just press <return>, you get a default name and you will realise the author is a music fan as the six names are John, Paul, George, Ringo, Mick and Jerry. For each player, you must select to play left or right handed and with one of four difficulty levels, beginner, enthusiast, amateur or professional. These affect the way the wind, bunkers and rough affect the ball, so they represent a sort of handicapping since on a given hole, it may be windy while the professional is playing but you get a sudden calm when the beginner takes his shot!

Tee up for the first hole

Then it's onto the course. The play starts in the order the players were entered but from then on the computer determines who plays. The player furth-

est from the hole always plays first and the winner of any hole starts first at the next. In the instruction book there is a detailed map of each hole for each of the courses showing any hazards such as trees and bunkers along with yardage. The reference guide also has a yardage ruler and a key to the maps along with a yardage for each of your fourteen clubs. At the top of the screen is a window showing all your clubs, distance of the hole, the par, distance left to play and the direction and strength of the wind.

Perfecting your swing

After selecting a club, you position a cursor on the screen showing the direction you wish to hit the ball. Press <menu> and a power meter slides quickly up to 100%. The skill comes in trying to stop the meter at the percentage level you want. If you fail to stop it in the right place on the way up it returns quickly towards zero. If it reaches 19% before you press a button, the stroke is played automatically.

Fine shot, Sir!

As well as hitting the ball straight you can impart slice or hook on the ball by pressing the left or right mouse buttons instead of the middle one. After pressing a button to select the power of the shot the window clears and a few seconds later the golfer makes a perfect swing and the ball flies off hopefully in the direction you want. The stroke is accompanied by some sampled sounds of the whoosh of the club through the air and the click as contact is made with the ball. The ball casts a shadow on the ground and gives you a good idea of distance and direction. If you land in some water you see the ripples and hear another sampled sound of the splash and if you hit the trees you hear the sound of crashing branches.

Putting

On reaching the green you have a view from above and the window now shows the slope of the green instead of the wind direction. The shot is played in the same manner as before and if the ball goes in the hole you hear the clatter as it drops or sometimes just the clatter as the ball hits the lip and jumps out again. After each hole, the scorecard is shown with all scores displayed.

Conclusions

I play golf and this game is the closest thing I've seen to the real game on a computer. The graphics are very good with a large scale golfer complete with bag and trolley (and a good swing!) and the sounds are very realistic.

Although all the holes can be frustrating, as in the real game, I found that after playing it for a short time I can return scores four or five under par at the professional level. I'm not sure how the game could be made more difficult without putting off the beginner but maybe a proper handicap system

would be better. I also thought it might be nice to get a printout of your scorecard at the end along with some criticism of your play. Instead, all that happens is you are asked if you want another game. Having said all this I still like the game and will continue playing it for some time to come but hope we might see some data discs in the future with more courses.

(I hear that 'Leaderboard' is to be released for the Archimedes. This is the golf game for most machines and I'm looking forward to comparing it with 'Holed Out'.) **A**

A3000 – The New BBC Micro

Paul Vigay

After months of rumours and speculation the new Archimedes has arrived. Designed as the new "British Broadcasting Corporation Computer System", with a specification similar to the existing Archimedes A310, it is hoped by Acorn to compete with the Commodore Amiga and the Atari ST.

What do you get for your money?

Priced at £649 + VAT (= £746.35), the A3000 is a single box 1 Mbyte machine measuring 480 x 325 x 70 mm. (This price does not include the monitor or the stand that you will need in order to balance it on top of the computer, which has ventilation holes in the top and no fan). A single 3.5" disc drive is fitted internally on the right hand side. This will hold up to 800k of data, although it will also read Acorn 640k ADFS discs (for compatibility with existing BBC and Master machines). A handy feature is that Acorn have fitted a duplicate 'drive in use' LED to the front panel. This saves looking around the side to check the light on the drive itself.

The machine has an extended PC style keyboard, exactly the same style as the existing A305 and A310, but it has a soft springy feel to the keys (a bit like an Amstrad PCW). The case itself is made from moulded plastic and can be opened up by undoing two screws at the rear.

External connectors

Standard sockets, all on the back panel, are:

- An analogue RGB connector and a separate phono socket giving a mono video signal.

- A 32 ohm 3.5 mm jack plug for headphones or for connecting to an external amplifier.
- A 25 pin D-type parallel printer port
- A 96 pin expansion connector. This allows existing Archimedes 'Podules' to be added externally, although Acorn are going to be producing a box to protect them. Only 64 pins are used, so podules such as the co-processor board, which uses the full 32-bit data bus, will not work.
- A 9 pin D type socket is fitted for the serial port. To complete this though, two additional chips must be fitted inside the machine.
- A connector also exists for the 'Econet' interface, though that again requires extra internal hardware – the same Econet upgrade as is used for the BBC Master and the A300 series.
- Finally, a blanking plate which covers the space which is provided for a single internal podule. These podules are a different layout from current Archimedes podules and use Molex connectors rather than Eurocard connectors. However, as far as we can ascertain, they can be electrically identical and can use the same software.

How fast is it?

The A3000 is equipped with the Acorn Risc Microprocessor (ARM) running at 8 MHz. This gives an average running speed of 4 MIPs, easily the fastest micro computer in its class. An improved memory controller (MEMC) chip has been used from the one in existing Archimedes machines and this has resulted in a speed increase of roughly 10% over the 300 series and the old 440.

I was surprised to find though, that the IBM PC emulator (available optionally) gave the same benchmark speed on both the A3000 and the A310, i.e. 1.8 times the speed of an XT. (Source: PC Landmark CPU test.)

Internal software

The A3000 comes fitted with Acorn's new multi-tasking operating system, RISC-OS, allowing multiple applications to be run from within a WIMP environment.

However, the standard 1 Mbyte may soon prove too small to run large applications under RISC-OS, so RAM expansion capability has been provided to give up to 2 Mbyte. This upgrade is not done by adding chips into existing sockets as on the 410/1 but by adding an extra circuit board onto a row of Molex pins. A hard disc may also be fitted, but this requires the purchase of the optional controller card, presumably fitted on the rear extension socket.

Stereo sound!!!

Eight built-in stereo sound channels are provided, as on other Archimedes computers but the A3000 has two speakers, one on each side of the keyboard, though admittedly they are only about 1" diameter. Music can be played using the internally generated or by buying one of the several sound samplers available for the machine. This can be up to a 16-bit sample rate and gives compact disc quality. (*But not through the internal speakers! Ed.*)

Graphics are equally impressive with 29 different screen modes, providing resolutions of up to 1056 x 256 pixels in 256 colours (selectable from a palette of 4096), including modes of 640 x 480 pixels in 256 colours (IBM VGA).

Software compatibility

Software compatibility is 100% with all existing Archimedes RISC-OS products. A support disc is available to allow many of the older Arthur versions to be upgraded to run under RISC-OS.

The machine is also supplied with two application 'Welcome' discs. One contains the three powerful applications (described in a previous article, Archive 2.7 p 20) and the other has various utilities and 'novelties'. A powerful BBC emulator will allow most 'officially written' BBC programs to be

run, including those that use direct screen access. (*These discs are identical, except for the sticky label, to the RISC-OS upgrade discs. Ed.*)

Conclusion

In all, this is an extremely flexible and powerful machine, being many times faster than either the ST and Amiga, its nearest rivals! However, since it is priced at nearly £700 without a monitor, a great many people may see it as an expensive alternative, even though it is far superior in virtually every application! Acorn's main market for the machine is in schools and education authorities, and so the quoted educational price of £529, which is not much more expensive than a BBC Master system, should encourage LEA's to buy.

Again, as with the first BBC Microcomputer system, seven years ago, Acorn has launched a machine using the latest technology and potentially more powerful than any of its rivals. If marketed properly, this could give Acorn's sales a much deserved boost.

A3000/A310, compare and contrast

Lastly, for the benefit of existing Archimedes owners, I will try to give details of the main differences between the A3000 and the A310, which has now been discontinued.

Of course, the biggest difference is that the computer is all in one moulded plastic box. It does take up rather less desk space but the second 3.5" drive or a hard disc would have to be fitted externally. Also, the plastic is thinner than that of the A310, so that the keyboard surround is flexible to the touch. How well this will stand up in a classroom environment is yet to be seen.

The other big difference is that of expandability. Although both machines only have a 16-bit podule interface (as opposed to the 400 series full 32-bit) the 310 can have up to 4 podules added internally by buying the appropriate backplane, whereas the A3000 can only support one internal, though others could be added externally with an appropriate interface box. I expect that third party suppliers will develop podule 'addon' boards in due course.

Another difference is the technology used for the circuit boards. The A3000 has quite a number of surface mounted components – both resistors and

capacitors – which presumably reduces manufacturing costs.

The disc drive on the A3000 is noisier than that on the 310 and is now on the side of the machine, requiring approx 6" wider space to allow for insertion of the discs.

The A3000 can use exactly the same software as the A310 and vice versa, so that will probably mean that more software will become available.

The A3000 is also approx 10% faster than the 310, although in practice this is hardly noticeable. A ray traced picture took 19 mins on the 310, whereas it took 17 mins 45 secs on the A3000.

One minor point is that the RGB output seems to be at a higher level. I had to turn the brightness down from the setting I use for my 310, though this may well vary from machine to machine.

To sum up, I prefer the 310 – the only real advantage of the A3000 being increased speed and possible easy upgrade to 2 Mbyte. (But upgrades for A310's should soon be coming available, going up to 4 Mbytes.) The A3000 is still a very powerful machine and I hope it sells well and encourages more software houses to write for it. **A**

Editor's comments

My initial experience with the A3000 wasn't too good. First of all, the mouse that was provided did not fit into the mousehole (which is, incidentally, underneath the computer in a recess that is rather awkward to get at). Some of the pins of the mouse were bigger than others and there was no way that I could force the plug into the socket, however, it did fit into the socket of an ordinary A310 and the mouse from a 310 fitted the A3000.

Then, I gave the A3000 a consumer

test by letting the kids play games on it. It lasted a couple of hours and then stopped completely – not even the power light was glowing. However, having taken the lid off and had a look around (forgive me, Acorn!) I discovered that the 1 amp fuse in the power supply had blown. I replaced this with a 2 amp fuse and all was (and is) well.

Finally, in an attempt to see how hot the power supply was running, I touched the heat sink and found that it was "hotter" than I had bargained for – electrically live! Yes, I know it says you shouldn't have it switched on with the lid off, but all other Archimedes computers have sealed power supplies so that idiots like me can't get a shock unless we start sticking screw-drivers through the holes. **A**



A3000 – The New BBC Microcomputer

Hard Disk Up-grading the 410/1

Mark Taylor

The Archimedes 410/1 and 420/1 computers come complete with a hard disc interface built in. Upgrading is therefore a very easy procedure that should present not problems to a user willing to have a go!

What is needed?

The first thing that is required is the disc drive itself. The model I used was a Miniscribe MS8425F which is widely available from many IBM PC dealers at around £229 + VAT. This is a 3.5" inch model which can easily fit inside the Archimedes case.

The 'F' in the model number is quite significant because it stands for fast. The average access time being 40ms as opposed to the standard MS8425 (£174 + VAT) which has a access time of 65ms. The Archimedes can of course handle both but since it is so fast, you might as well use the fastest you can for a reasonable price. Almost any hard disc can be used as long as it has the ST506 interface.

You will also need two cables to join the disc to the main PCB. These cables need to have a SpeedBloc connector on one end (main PCB end) and a type 2 edge connector on the other (disk end). Both cables are made from standard ribbon cable, one being 20 way wide and the other 34 way. The cables need not be more six inches (150mm) long and so a trip to the local electronics shop is needed since a 10m reel of cable comes a bit expensive.

The SpeedBloc part numbers (from RS Components) are as follows:

34way polarized socket 474-322

20way polarized socket 474-300

34way type 2 edge con. 471-339

20way type 2 edge con. 471-317

Fixing the connectors onto the cable is supposed to be done using a special insulation displacement tool, but with a little care, it can be done using a simple metalwork vice, applying steady pressure until the ID pins cut into the cable and the fixing clips snap into place, but make sure the cable is in the correct position before applying the pressure.

Installation

The first thing to do is to disconnect the computer from the mains and then you can remove the cover of the computer by unscrewing the two screws at the

sides and the three at the back then sliding the cover back slightly and lift up.

The hard disc itself can rest on the support bar towards the front of the machine. Mounting is a small problem because you will not have any of the Acorn supplied mounting brackets. I made a couple of L-shaped brackets from aluminium sheet. There are two screw holes on the either side of the drive and two holes in the support bar which can be used by the brackets.

The drive should be mounted on the support bar with the circuit board facing down – there is no danger of the circuit board shorting out on the bar. All that is left to do now is connect the cables to the drive and the main pcb. The orientation of the cables is of course very important, when looking from the front of the machine pin 1 is on the extreme left hand side in the row nearest to the front. Pin 1 of the drive edge connector is on the left hand end on the top edge if the drive is placed pcb down. Therefore the two cables need not to cross or have a twist in them. The only other connection to be made is the power cable which is connected to the socket on the left hand side.

Before replacing the cover make a note of the disc defect map which should be written on the top of the disc. This is needed during the format process.

A disc access LED has been included in the basic design by Acorn. It is behind the front facia, but its illumination can be seen through the plastic.

Formatting

Before formatting the disc you must re-configure the Archimedes for the hard disc, by typing:-

```
*Configure HardDisks 1
```

The next step is to format the disc, using Acorn's formatting program (HFORM) which you should find on the RISC-OS support disc in the 'Acorn' directory. Just follow the instructions adding the bad spots you made a note of from the top of the drive, when asked to do so.

The installation process is now complete and you can now use the drive. **A**

I think Mark underestimates the difficulty of the physical fixing of the drive. It is not, in my view, a two minute job, though it is not too difficult a job if you are keen to have a go. Ed.

BBC Compatibility Column

Richard Averill

I was hoping this month to bring you a review of the "65Host" BBC emulator, which is the new BBC emulator supplied with RISC-OS. Unfortunately, I have not yet been supplied with a RISC-OS upgrade kit, so, there is no 65Host review!

However, there are some new developments going on in the software front. I am considering writing Archimedes DFS and MS-DOS filing systems, and I have revamped the application to perform transfer from BBC DFS discs to ADFS discs for the RISC-OS environment.

Finally, an application also using the WIMP environment to perform file transfer between many different disc formats is currently being written. This would allow, for example, the transfer of files directly from a BBC DFS disc to an IBM MS-DOS disc. However, it may be better to write individual filing systems for this purpose, although it depends whether this is viable.

DFS readers

If you are looking for a good DFS reader, I would like to inform you that the very latest WIMP DFS reader / backup / archiver utilities are available through the BBC column on receipt of a formatted 800k 'D' disc and £3 to cover handling and development costs. I have just completed versions for A305 users, so please specify if you would like these as well as the normal versions. RISC-OS versions will be completed when I have RISC-OS!

Write in!

As always, I am on the look out for BBC orientated stuff to include in the BBC column. Send in your queries, ideas, program modifications, features, etc. to me c/o the Archive office.

Finally, could I ask Archive readers to send in details of BBC programs which run on the Archimedes for a new BBC Compatibility List which will be printed in the column? Please test the various programs out in as many different environments as possible (i.e. 65Arthur, BBCrun, 65Host and 'native' BASIC V) and include modifications if required.

Problems in da Sharemaster mod, boss!

In the April BBC column, (Archive 2.6 page 38) modifications to enable Synergy Software's ShareMaster application (see review in A&B Computing June 1989 pp 29-33) to run on the Archimedes were listed. The information provided was not, unfortunately, completely correct. I would like to register my sincere thanks to Gordon Barker for his help in solving the problems!

Naturally, all information is printed in this column in good faith! No responsibility is taken by us for damage caused due to incorrectness of any information printed in the BBC column.

```
*|> ShareMods
*| Converting Sharemaster
*| to the Archimedes.
*| Devised by Gordon Barker.
*| From Archive BBC Column 3.
*BASIC
LISTO 1
LOAD "MENU"
3100 IF Xi=49 THEN CHAIN"EDIT":END
3110 IF Xi=52 THEN CHAIN"PORT":END
3120 IF Xi=50 THEN CHAIN"PRICE":END
3130 IF Xi=51 THEN CHAIN"CHART":END
3150 IF Xi=53 THEN CHAIN"ANLY":END
3180 IF Xi=55 THEN *FX200,0
3190 IF Xi=55 THEN *QUIT:*BASIC
3192
3220
SAVE "MENU"
LOAD "PORT"
141 DEF PROCQ:CHAIN"MENU":END
430 CLS
SAVE "PORT"
LOAD "EDIT"
900 CLS
1800 DEFPROCV:CHAIN"MENU":END
SAVE "EDIT"
LOAD "PRICE"
70
291 DEFPROCV:CHAIN"MENU":END
2630 CLS
SAVE "PRICE"
LOAD "ANLY"
90 DEFPROCV:CHAIN"MENU":END
2630 CLS
SAVE "ANLY"
LOAD "CHART"
50
```

```
3850 IFTD%<>` PROCs
6100 DEFPROC V:CHAIN"MENU":END
SAVE "CHART"
```

As before, the mods are included on the programs disc. To convert your copy of ShareMaster, copy the file to the directory the ShareMaster programs are held in, select this directory and type *Exec ShareMods.

Pound sign problems?

You may notice that the modification to make to line 3850 of program "CHART" has been changed from 3850 IFTD%<>` PROCs to 3850 IFTD%<>` PROCs. The alteration is so small that it probably was the reason for the mistake in the first place – a forwards apostrophe has been changed to a backwards apostrophe.

As an illustration, type the following (in BASIC) on a BBC micro and then on your Archimedes:

```
PRINT CHR$(96)
```

A pound sign should be displayed on the BBC and a backwards apostrophe on the Archimedes. The reason for this is that the ASCII code of the pound sign has been changed from 96 on the BBC to 163 on the Archimedes (i.e. PRINT CHR\$(163) on the Archimedes will display the pound sign.)

The Archimedes now has two apostrophes instead of the BBC's one upright one. There is the opening or backwards apostrophe (') with the ASCII code of 96 and the closing / forwards apostrophe (') with the ASCII code of 39.

Master Compatibility

So what can you do to rectify this compatibility problem? Aha! It is really a very simple matter. Use the following two (undocumented) commands:

```
*Alphabet Master
*Keyboard Master
```

to convert both the keyboard and on-screen definitions of the pound code to code 96. The commands are provided by the "International" module to redefine the relevant parts of the Archimedes' alphabet and keyboard to Master compatible values.

After these commands have been issued, Master 128 software using the box drawing characters will now appear correctly on screen. The most notable illustration of this problem is the "Edit" ROM when loaded into the Archimedes' 6502 emulator.

I noted in the previous article that I assumed that the modifications would enable ShareMaster to run in 'native' (i.e. BASIC V) mode rather than under a 6502 emulator. I have been informed by Gordon that my assumptions were not correct! ShareMaster still requires the 65Arthur emulator as well as these modifications to operate correctly.

Gordon has also informed me that he uses ShareMaster with a hard disc. The increased performance gained can probably be attributed to the faster hard disc rather than the emulator, although screen update with the 65Arthur emulator should be faster than on a BBC/Master.

The problem of the incorrect printing of the total cost, total valuation and total gains of the "performance" sub-menu has unfortunately still not been solved. Again, if you have the information on the solution to this problem then I would be delighted to hear from you!

Correct tabulations!

An interesting technique detailed by Philip Armstrong is that text alignment problems may be encountered if BBC programs are run in graphics modes other than the ones originally used. For example, a program originally using mode 2 on the BBC (160 x 256, 16 colours) could be changed to use mode 12 on the Archimedes (640 x 256, 16 colours). However, you are likely to run into problems with the x alignment of text when using the PRINT TAB(x [,y]) function, since there will be 80 columns of text instead of 20 columns.

The 'Global Replace' command (f5) of the Archimedes' excellent BASIC Editor can be used to search for "TAB(" and to replace this with "TAB([new x columns/old x columns]*". For example, if an 80 column mode (e.g. mode 12) is being used instead of a 20 column mode (e.g. mode 2), search for "TAB(" and replace with "TAB(4*".

This can be applied when using programs in Multisync modes 18/19/20/21 with 64 instead of 32 text rows. Use TAB(...*2). Unfortunately, this is a bit laborious since, in this case, the BASIC editor cannot be used to search and replace automatically.

Aesthetics

I should imagine that the above technique may not work in some situations, but it is a very useful method of enhancing BBC programs. You will

probably not need to worry about graphics or colours but of course the programs can be made more aesthetically pleasing by re-defining the screen colours by including in your BASIC programs:

COLOUR colour, red component, green component, blue component.

For example, COLOUR 7, &F0, &F0, &E0 or COLOUR 1, 240, 240, 224 will mix the foreground colour to cream.

Hi-resolution graphics dumps

Philip would also like to know whether screens of the ultra-high resolution mode 23 (1152 x 900) provided by RISC-OS can be printed out with the new HardCopy module? If not, then would anyone like to write a dump for the BBC column for this mode? I suspect that since high resolution monochrome monitors are not very common, most folk would have to switch their monitors off when printing these screens! **A**

SYS and Other Special FX – 4

Gerald Fitton

In the first three articles of this series we have seen how to use system, global, local variables and parameters. We have also seen how to set up an "application directory" under RISC-OS and produce an application icon. We have also seen how to write the !Boot and !Run obey files so that if you double-click on the application "icon", the application "works".

(I'm worried by rumours that the deliveries of RISC-OS are late, with only one in ten being delivered. Hopefully, by the time you get this, *(You must be joking. Ed.)* you will have installed RISC-OS. If not, then you may have to bear with us a little, since half of this month's programs will work only in RISC-OS. There are four programs on the monthly disc: SysFX060 and SysFX-061 will work under Arthur but SysFX070 and SysFX-071 work only under RISC-OS. Each of these programs is about 9k long so SysFX070 is the only full listing.)

If any of you have any problems with these or related programs, whilst you are welcome to write to Paul at the usual Archive address, I am happy to reply to you directly; my address is at Abacus Training which you will find on the back inside cover of Archive. All I ask is that you include an S.A.E. or, better still, the program you've written (but doesn't work) on a disc and please be a little patient (sometimes as long as two weeks) waiting for the reply. Summer is coming and I know I get more time to "think" then and a few challenges will be a welcome stimulant.

Where were we last month?

From BASIC, the syntax of any SoftWare Interrupt, SWI, is: SYS "OS.....Op",ReasonCode%, parameter1%,parameter2%,etc.,etc.

The BASIC command SYS is followed by either the name of the SWI in inverted commas, e.g. "OS_SpriteOp", or use the SWI number, e.g. &2E which is the value of the variable "OS_SpriteOp".

The first parameter passed to a SWI is ReasonCode%. In the PRM nearly all the valid reason codes for each SWI are given. Some reason codes are not documented, either because they might change in future issues (and Acorn don't want to continue to support them) or because they do something secret, for example, let you copy a protected disc!

The ReasonCode% is followed by an optional number of parameters. Generally these parameters can be strings such as the name of a sprite (e.g. "planet"), but more often they are "pointers". A pointer is an integer such as name% which is the address of the start of a set of bytes containing either the ASCII codes of a string (e.g. starting at the address name% you might find the ASCII codes for "planet" which you could print by using the command PRINT \$name%) or it might be a pointer to a control block (see below).

Many SWI commands give the user the option of using either the string itself or a pointer to the string and the OS will decide which you have used.

Another use for a pointer is to point to a block of memory used for a definite purpose such as a user sprite area. In some of my programs, I have declared a block of memory for user sprites with a command such as: DIM user% size%. In that case, user% would be a pointer to the start of the block. The first few bytes of these blocks of memory might contain information about how the block of memory is used. Such information is called a "control block". In the case of user sprites, the first sixteen bytes contain such information as the size of the block, the number of sprites it contains, the offset from the start of the block to the first sprite and the offset to the blank space where the next sprite will be loaded.

Programs SysFX060 and SysFX061.

These programs which are on the monthly program disc are Arthur versions of a graphics demonstration using sprites to show a satellite orbiting a planet.

The only difference between these two programs is line 310. In the program SysFX060 this is `create%=TRUE` and in SysFX061, `create%=FALSE`. The variable "create%" is called a "flag" and has one of only two values "TRUE" (in capitals) or "FALSE". The flag is tested at line 1030 and, if it is TRUE, then the procedure PROCcreate is executed. The procedure PROCcreate creates the three sprites called "planet", which is the whole planet complete with axis and satellite orbit, "planet_top", the top half of the planet and "satellite", a small version of the planet without an orbit. PROCcreate does this by making calls to PROCdrawglobe which is the same as that listed in SysFX070. In SysFX060 the sprites are drawn on the screen, grabbed into a user sprite area and then the three sprites are saved onto disc into a single sprite file having the name "Orbit" (see line 680 of SysFX070 for the full path name to this file). In SysFX060 the slow procedure PROCmakemask creates transparent masks for "planet_top" and "satellite". The most relevant lines in SysFX060 are:

```
11480 SYS "OS_SpriteOp",readsize%
      ,user%,name% TO ,,width%,height%
11510 SYS "OS_SpriteOp",makemask%
      ,user%,name%
11580 SYS "OS_SpriteOp",readcol%,
      user%,name%,x%,y% TO colour%
11600 SYS "OS_SpriteOp",writecol%
      ,user%,name%,x%,y%,mask%
```

The reason codes are:

```
readsize% = 40+256
makemask% = 29+256
readcol%   = 41+256
writecol%  = 44+256
```

The reason code `readsize%` returns the width and height of the sprite in pixels (not graphics co-ordinates); the three commas after the word TO are significant. The reason code `makemask%` doubles the size of the sprite to make room for the mask. The bytes of the mask can contain any value from 0 to 255. If the value corresponding to a particular pixel is 0 then that pixel is transparent. In the PRM, the alternative value given for `mask%` is 1. This will give you problems. The "correct" other value is -1, which (using 2's complement) will give you 255. The reason for using 255 is that, when the sprite is plotted with GCOL 8 (see line 12250 of SysFX070), the logical colour (a number between 0 and 255) of the sprite is combined with that of the screen and mask using an exclusive OR formula. If you don't want colour changes then -1 is the value you want in the mask.

The 256 in the reason code is necessary because we have a user sprite area (for which the pointer is `user%`). The

variable, `name%`, is a pointer to the name of the sprite (either "planet_top" or "satellite"). The values `x%` and `y%` are measured in pixels and not, as you might innocently expect, in graphics co-ordinates. The variable, `mask%`, contains the value to be written to the mask; this is 0 for a transparent pixel and is unchanged from -1 for "solid" colour. We shall see (in SysFX070) that under RISC-OS there is a much faster way of creating masks: a fraction of a second instead of five minutes.

The procedure PROCanimate provides an animation in which the satellite orbits the planet. First the whole planet is plotted without mask, so blotting out the previous picture, the satellite is plotted next, and finally the top half of the planet is plotted so that it will obscure the satellite when it is behind the planet. In SysFX060, in order to prevent flicker, two screenbanks are used. One screen is displayed whilst the other is being plotted. The screens are swapped over after the picture has been fully drawn. If you do get flicker then check whether you have configured 160k of screen memory. Under RISC-OS, the screen memory is allocated dynamically.

Because of this, you will have to use the task manager (bottom right icon) to set the screen size to 160k before running SysFX061; it is no use relying on your *CONFIGURED screen size under RISC-OS. The screenbank switching "effect" is executed either with calls such as *FX 112,1 or with SYS "OS_Byte" using as reason code 112 (select the screen to show) or 113 (select the screen to draw) and the screen bank as the parameter. For example, in line 12020 of program SysFX060 we find SYS "OS_Byte",`draw%`,`drawscreen%`. The variable `draw%` takes the value 112 and `drawscreen%` takes values 1 or 2 alternately. We shall see in SysFX070 and SysFX071 that there is a much better way of getting flicker free animation than screenbank switching under RISC-OS.

The Monthly Disc

If you don't have RISC-OS, the monthly disc does contain SysFX060 and SysFX061 and you will have to be content to use those until you plug in the new chips. If you have RISC-OS and double click on the the application directory !SysFX, you will RUN the program SysFX071 which is detailed below. You can alter the Obey file !Run using !Edit to call any of the programs in the BasicProgs subdirectory.

The Programs SysFX070 and SysFX071.

The only difference between these two programs is line 310; once again the "flag" `create%` is set to TRUE or FALSE and controls whether PROCcreate is called or not. The full listing of SysFX070 is included below, so

I can happily refer you to the line numbers. There are three new sprite calls I'm using in this program found in RISC-OS but not in Arthur. They are:

```
10510 SYS "OS_SpriteOp", 60+256, suser%,
      splanet1% TO vdu0%, vdu1%, etc.
10700 SYS "OS_SpriteOp", vdu0%, vdu1%
      , vdu2%, vdu3%
10950 SYS "OS_SpriteOp", 61+256, suser%,
      splanet2% TO vdu0%, vdu1%, etc.
12250 SYS "OS_SpriteOp", scaleplot%,
      user%, pointer%, left%, etc.
```

The reason code 60+256 redirects all VDU output to the named sprite and reason code 61+256 to the mask of that sprite. The sprite must exist. All the vdu values necessary for restoring output to the screen are held in a block for which vdu3% is the pointer. Line 10700 is a simple way of cancelling the effect of line 10510. We can forget about reason code get% for grabbing a sprite from the screen since we send output directly to the sprites "planet" (10510), "planet_top" (10620) and "satellite" (10700).

What is even more useful, instead of creating the transparency mask byte by byte with reason code writocol% (see SysFX060) we can use reason code 61+256 to redraw the sprites directly to the masks of "planet_top" (10950) and "satellite" (10840). If you decide to use this reason code for your own sprites remember to set the transparent colour to 0 and all other colours to the value -1. The command CLG (clear the graphics screen - line 10870) is used to set the colour of all pixels in the mask to the value 0. The command CLG is followed by redrawing the sprite with the output redirected to the mask. This way of creating masks is much faster than the pixel by pixel method of SysFX060. Try it and see.

This facility to send VDU output to a sprite is used to good effect in PROCanimate. Look at line 11760:

```
11760 SYS "OS_SpriteOp", vdu%, suser%,
      sall% TO vdu0%, vdu1%, vdu2%, vdu3%
```

Instead of redirecting the sprite plotting operation to an unseen screen bank with *FX 112,2, the three sprites which make up the full picture are sent to an invisible sprite called "all" (11840 to 1900). The VDU output is restored to the screen (11930) and the single sprite "all" is plotted to the visible screen (11950). This saves all the complications of screen bank switching, it is more economical on memory, and, overall, gives a faster animation. List both SysFX061 and SysFX071 and run them and make your own comparisons.

The comparison in speed is not quite fair because I have also introduced reason code 52+512 at line 12250. This reason code allows scaled plotting. The control block for the scale factors is set up at lines 460 to 500 using global values for the scale up and scale down factors declared at lines 290 and 300. The variable scale% in 12250 is a pointer to that control block. Any rational (i.e. fractional) scale factor can be produced by a combination of scaleup% and scaledn%. For example, to increase by a factor of 1.5 ($= 3/2$) make scaleup% = 3 and scaledn% = 2. If I have used my global variables correctly then changing either of them will ripple through the program without the need for any other amendments. Give it a try. The resulting animation is quite reasonable considering the size of the sprites plotted (over 10k each) and the number of plots ("planet", "planet_top", "satellite" and "all"). Just to prove that the golden rule (use variables and not values) works, you might like to try changing line 280, the size of everything in the program or the stepsize of the animation (11690) or even line 270, the angle of inclination of the axis, or the point on which the animation is centred (250 and 260).

If you feel really brave you could change line 220 to MODE 15 and adjust the colours (10220 to 10290). I think I've left enough room at line 340 but you may have to delete the "DIV2". Don't try this with SysFX060 because the mask creation time is prohibitive.

What's Next?

I haven't said anything about the use of sequence, repetition and conditional execution in good programming, nor have I written about the use of white space and REMs within the program - some editors don't like this "waste" of space. Nor have I mentioned the dreaded documentation, flow or structure diagrams. However, you may be able to recognise the application of some of these principles in the programs of this series.

In the next article we'll have a look at some of the SWI calls which are used by Acorn's Window manager. Using these SWI calls are essential if you want to run programs in "multitasking" windows. Inevitably there is going to be some overlap with Adrian Look's excellent series, but I hope you'll bear with me over that. For those of you who want a quick preview, double-click on the !WimpSys icon on this month's disc. Three windows will open. When you click within any window that window is redrawn. You can close all three windows by closing Window 1 and you can have many incarnations of !WimpSys running simultaneously.

P.S. Try the SYS program in !DiscUtils.

SYS and Other Special FX

```

100 REM > <SysFX$Dir>.BasicProgs
      .SysFX070
110 REM Author : G L Fitton
120 REM Copyright: ABACUS TRAINING
130 REM Version 0.00 : 29th April 89
140 :
150 REM User Sprites with Masks.
160 :
170 REM PreCore Section.
180 REM Set up error trap.
190 ON ERROR PROCerror
200 :
210 REM Choose the mode.
220 MODE 12
230 :
240 REM Declare global variables.
250 xcentre% = 640 : REM Centre of
      picture
260 ycentre% = 512
270 angle = 3*PI/8 :REM Inclination
      of the axis.
280 ssize% = 512 :REM Sprite size
290 scaleup% = 2 :REM Scale up sprite
300 scaledn% = 2 :REM Scale it down
310 create% = TRUE:REM Create sprites
320 :
330 REM Reserve a user sprite area.
340 spritearea% = (ssize%^2)/DIV2
      :REM Suitable size for mode 12
350 DIM suser%      spritearea%
360 :
370 REM Set up the control block.
380 suser%&00 = spritearea%
390 suser%&04 = &00:REM Initial
      number of sprites is zero.
400 suser%&08 = &10:REM Sprites
      start at offset of &10.
410 suser%&0C = &10:REM No sprites
      yet so end = start.
420 :
430 REM Sprite scale factor pointer
440 DIM sscale%      &10
450 :
460 REM Sprite scale factors.
470 sscale%&00 = scaleup% :REM Scale
      up for x
480 sscale%&04 = scaleup% :REM and y
490 sscale%&08 = scaledn%:REM Scale
      down for x
500 sscale%&0C = scaledn% :REM and y
510 :
520 REM Pointers to sprite names.
530 DIM splanet1%      &20
540 DIM splanet2%      &20
550 DIM ssatellite%    &20
560 DIM sall%          &20
570 :
580 REM The sprite names.
590 $splanet1% = "planet"
600 $splanet2% = "planet top"
610 $ssatellite% = "satellite"
620 $sall% = "all"
630 :
640 REM Pointer to name of file
      containing the sprites
650 DIM fname%      &20
660 :
670 REM Name of file containing
      sprites
680 $fname% = "<SysFX$Dir>."
      MySprites.Orbit"
1000 REM Core Section
1010 :
1020 OFF
1030 IF create% = TRUE THEN
1040 PROCcreate(xcentre%,ycentre%,
      angle%,ssize%,suser%)
1050 ENDIF
1060 :
1070 PROCanimate(xcentre%,ycentre%,
      angle%,ssize%,sscale%,suser%)
1080 ON
1090 END
1100 :
10000 DEF PROCerror
10010 REM Reports an error.
10020 :
10030 SYS "OS_SpriteOp",vdu0%,vdu1%,
      vdu2%,vdu3%
10040 REPORT
10050 PRINT " at line ";ERL
10060 ON
10070 :
10080 END
10090 :
10100 DEF PROCcreate(xcentre%,
      ycentre%,angle%,ssize%,suser%)
10110 REM Create sprites for animation
10120 LOCAL toponly%,orbit%
10130 LOCAL black%,red%,green%,
      yellow%,blue%,magenta%,cyan%
      ,white%,solid%
10140 LOCAL planetaxis%,planetglobe%,
      planetorbit%,sataxis%,
      satglobe%,satorbit%
10150 LOCAL vdu0%,vdu1%,vdu2%,vdu3%
10160 :
10170 REM Initialise local variables.
10180 toponly% = TRUE:REM Draw planet
      top half only.
10190 orbit% = TRUE :REM Draw
      satellite orbit.
10200 :

```



```

10210 REM Mode 12 colours.
10220 black% = 0
10230 red% = 1
10240 green% = 2
10250 yellow% = 3
10260 blue% = 4
10270 magenta% = 5
10280 cyan% = 6
10290 white% = 7
10300 solid% = -1 :REM "colour"
10310 : for the masks
10320 REM Colours of the sprite
10330 planetaxis% = white%
10340 planetglobe% = blue%
10350 planetorbit% = cyan%
10360 sataxis% = white%
10370 satglobe% = yellow%
10380 satorbit% = black%
10390 :
10400 REM Create the sprites
10410 SYS "OS_SpriteOp",16+256,
    suser%,sall%,1,0,0,ssize%,ssize%
10420 SYS "OS_SpriteOp",16+256,suser%
    ,splanet1%,1,0,0,ssize%,ssize%
10430 SYS "OS_SpriteOp",16+256,suser%
    ,splanet2%,1,0,0,ssize%,ssize%
10440 SYS "OS_SpriteOp",16+256,suser%
    ,ssatellite%,1,0,0,ssize%/8,ssize%/8
10450 :
10460 REM Expand "planet_top" and
    "satellite" for mask.
10470 SYS "OS_SpriteOp",29+256,suser%
    ,splanet2%
10480 SYS "OS_SpriteOp",29+256,suser%
    ,ssatellite%
10490 :
10500 REM VDU output to sprite called
    "planet".
10510 SYS "OS_SpriteOp",60+256,suser%
    ,splanet1% TO vdu0%,vdu1%
    ,vdu2%,vdu3%
10520 :
10530 REM Whole globe called "planet"
10540 toponly% = FALSE
10550 orbit% = TRUE
10560 PROCdrawglobe(0,0,angle,ssize%,
    planetaxis%,planetglobe%,
    planetorbit%,toponly%,orbit%)
10570 :
10580 REM Restore VDU o/p to screen
10590 SYS "OS_SpriteOp",vdu0%,vdu1%,
    vdu2%,vdu3%
10600 :
10610 REM VDU output to sprite called
    "planet_top".
10620 SYS "OS_SpriteOp",60+256,suser%
    ,splanet2% TO vdu0%,vdu1%,
    vdu2%,vdu3%
10630 :
10640 REM Top half of globe only
    called "planet_top".
10650 CLG
10660 toponly% = TRUE
10670 orbit% = TRUE
10680 PROCdrawglobe(0,0,angle,ssize%,
    planetaxis%,planetglobe%,
    planetorbit%,toponly%,orbit%)
10690 REM Restore VDU o/p to screen
10700 SYS "OS_SpriteOp",vdu0%,vdu1%
    ,vdu2%,vdu3%
10710 :
10720 REM VDU output to sprite called
    "satellite".
10730 SYS "OS_SpriteOp",60+256,suser%
    ,ssatellite% TO vdu0%,vdu1%,
    vdu2%,vdu3%
10740 :
10750 REM Sprite called "satellite"
    drawn at 1/8th scale without orbit
10760 CLG
10770 toponly% = FALSE
10780 orbit% = FALSE
10790 PROCdrawglobe(0,0,angle,ssize%/
    8,sataxis%,satglobe%,satorbit%
    ,toponly%,orbit%)
10800 REM Restore VDU o/p to screen
10810 SYS "OS_SpriteOp",vdu0%,vdu1%,
    vdu2%,vdu3%
10820 :
10830 REM VDU output to mask of
    sprite called "satellite".
10840 SYS "OS_SpriteOp",61+256,suser%
    ,ssatellite% TO vdu0%,vdu1%,
    vdu2%,vdu3%
10850 :
10860 REM Sprite called "satellite"
    is drawn at 1/8th scale w/o orbit
10870 CLG
10880 toponly% = FALSE
10890 orbit% = FALSE
10900 PROCdrawglobe(0,0,angle,ssize%/
    8,solid%,solid%,satorbit%,
    toponly%,orbit%)
10910 REM Restore VDU o/p to screen
10920 SYS "OS_SpriteOp",vdu0%,vdu1%,
    vdu2%,vdu3%
10930 :
10940 REM VDU output to mask of
    sprite called "planet_top".
10950 SYS "OS_SpriteOp",61+256,suser%
    ,splanet2% TO vdu0%,vdu1%,vdu2%,vdu3%
10960 :

```

SYS and Other Special FX

```

10970 REM Draw top half of globe (to
10980 CLG                                mask)
10990 toponly%      = TRUE
11000 orbit%        = TRUE
11010 PROCdrawglobe(0,0,angle,ssize%,
                solid%,solid%,solid%,
                toponly%,orbit%)
11020 REM Restore VDU o/p to screen.
11030 SYS "OS_SpriteOp",vdu0%,vdu1%
                ,vdu2%,vdu3%
11040 :
11050 PROCsavesprite(suser%,fname%)
11060 ENDPROC
11070 :
11080 :
11090 :
11100 DEF PROCdrawglobe(left%,bottom%
                ,angle1,size%,axiscol%,globecol%,
                orbcoll%,drawtoponly%,draworbit%)
11110 REM Draws a globe to be used as
                a sprite.
11120 LOCAL xc%,yc%,rad%,angle2
11130 :
11140 REM Initialise local variables.
11150 xc%      = left%  +size%/2
11160 yc%      = bottom%+size%/2
11170 rad%     = size%/4
11180 angle2   = angle1-PI/2
11190 :
11200 IF drawtoponly%=FALSE THEN
11210 REM Draw globe axis.
11220 GCOL axiscol%
11230 ELLIPSE FILL xc%,yc%,size%/
                2,size%/64,angle1
11240 :
11250 REM Draw globe bottom half.
11260 GCOL globecol%
11270 MOVE xc%,yc%
11280 MOVE xc%-rad%*COS(angle2)
                ,yc%-rad%*SIN(angle2)
11290 PLOT &B5,xc%+rad%*COS(angle2)
                ,yc%+rad%*SIN(angle2)
11300 :
11310 IF draworbit%=TRUE THEN
11320 REM Draw satellite orbit.
11330 GCOL orbcoll%
11340 ELLIPSE xc%,yc%,size%/8,
                size%/2,angle1
11350 ENDIF
11360 :
11370 ENDIF
11380 :
11390 REM Draw globe top half.
11400 GCOL globecol%
11410 MOVE xc%,yc%
11420 MOVE xc%+rad%*COS(angle2),yc%
                +rad%*SIN(angle2)
11430 PLOT &B5,xc%-rad%*COS(angle2),
                yc%-rad%*SIN(angle2)
11440 ENDPROC
11490 :
11500 DEF PROCsavesprite(user%,name%)
11510 REM Saves the user sprite area
                to disc.
11520 LOCAL save%
11530 REM Initialise local variable.
11540 save% = 12+256
11550 :
11560 SYS "OS_SpriteOp",save%,user%
                ,name%
11580 ENDPROC
11590 :
11600 DEF PROCanimate(xcentre%,
                ycentre%,angle%,ssize%,
                sscale%,suser%)
11610 REM Animates the display.
11620 LOCAL angle1,angle2,xshift%,
                yshift%,stepsize,vdu%,vdu0%
                ,vdu1%,vdu2%,vdu3%
11630 :
11640 REM Angles and positions used
                for the animation.
11650 angle1 = 0:REM Angular position
                of satellite.
11660 angle2 = angle-PI/2:REM
                Inclination of orbit.
11670 xshift% = ssize%*COS(angle2)
                :REM Centre of satellite (initial)
11680 yshift% = ssize%*SIN(angle2)
11690 stepsize = PI/45
11700 vdu%      = 60+256
11710 :
11720 REM Animate the display.
11730 PROCloadsprite(suser%,fname%)
11740 REPEAT
11750 REM VDU o/p to sprite "all".
11760 SYS "OS_SpriteOp",vdu%,suser%
                ,sall% TO vdu0%,vdu1%,vdu2%,vdu3%
11770 :
11780 REM Increment the angular
                position of the satellite
11790 angle1=angle1+stepsize
11800 xshift%=ssize%*COS(angle1)/
                2*COS(angle2)-ssize%*
                SIN(angle1)/8*SIN(angle2)

```



```

11810  yshift%=ssize%*SIN(angle1)/      12140  :
        8*COS(angle2)+ssize%*          12150  REM Initialise local variables.
11820  :    COS(angle1)/2*SIN(angle2)    12160  choose%    = 24+256
11830  REM Plot whole planet to          12170  plot%      = 34+512
        sprite "all"                    12180  scaleplot% = 52+512
11840  PROCplotsprite(suser%,-1,         12190  gcol%      = 8
        splanet1%,0,0)                  12200  :
11850  :                                12210  REM Find the sprite pointer.
11860  REM Plot satellite to "all"        12220  SYS "OS_SpriteOp",choose%,user%
11870  PROCplotsprite(suser%,-1,          ,name% TO ,,pointer%
        ssatellite%,ssize%/2-ssize%     12230  REM Plot the sprite.
        /16+xshift%,ssize%/2-          12240  IF scale%<-1 THEN
        ssize%/16+yshift%)              12250  SYS "OS_SpriteOp",scaleplot%,
11880  :                                user%,pointer%,left%,bottom%
11890  REM Plot top half of planet        ,gcol%,scale%,-1
        to sprite "all".                12260  ELSE
11900  PROCplotsprite(suser%,-1,          12270  SYS "OS_SpriteOp",plot%,user%
        splanet2%,0,0)                  ,pointer%,left%,bottom%,gcol%
11920  REM Restore VDU o/p to screen      12280  ENDIF
11930  SYS "OS_SpriteOp",vdu0%,vdu1%     12290  ENDPROC A
        ,vdu2%,vdu3%
11940  REM Plot sprite: "all".
11950  PROCplotsprite(suser%,
        sscale%,sall%,xcentre%-
        ssize%/2*scaleup%/
        scaledn%,ycentre%-ssize%
        /2*scaleup%/scaledn%)
11960  UNTIL angle1>23*PI/2
11980  ENDPROC
11990  :
12000  DEF PROCloadsprite(suser%
        ,name%)
12010  REM Loads sprite file
        from disc
12020  LOCAL load%
12030  REM Initialise local
        variables.
12040  load% = 10+256
12050  :
12060  SYS "OS_SpriteOp",load%,
        user%,name%
12070  :
12080  ENDPROC
12090  :
12100  DEF PROCplotsprite(suser%,
        scale%,name%,left%,bottom%)
12110  REM Plots a sprite to
        screen
12120  REM from the user sprite
        area.
12130  LOCAL choose%,scaleplot%,
        plot%,gcol%,pointer%

```

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BASIC V Forum

Clifford Hoggarth

BASIC V or BASIC V?

I've been comparing BASIC V version 1.02 (Arthur 1.20) and version 1.04 (RISC-OS). There are a few extra features and several bugs have been fixed. There is also an overall speed increase. Here is a brief overview of the main changes.

Faster and faster

The table shows the timings of various structures, these values all apply to BASIC running in RAM (since its not possible to have both versions in ROM!!), under RISC-OS. As can be seen, there is an overall speed increase of about 10%. It should be noted that some features will appear to be quicker since the operating system has also been speeded up (e.g. disc access, printing to screen), but these are not due to changes in BASIC which is what I'm considering here.

Much of this speed increase is due to faster handling of variables and evaluation of expressions. For example, part of the speed increase for REPEAT...UNTIL and WHILE...ENDWHILE loops must be attributable to the faster incrementing of the variable used as a counter within the loop ($A\%+=1$). Acorn state that the following areas have been speeded up:

"Simple expressions (indeed very complex ones have been slowed down!), SYS statement, especially where no results (no TO) are required, string allocation (by varying amounts depending on what is happening)."

SYS calls are faster with RISC-OS since the operating system's method of searching for the correct routine is now faster, as well as the speed up due to BASIC changes.

The major area which seems to have slowed down is the speed of FOR...NEXT loops. PROCedure calls with no parameters also appear slower, but those with parameters are faster, which is more important.

New commands

The following is a brief summary of the new commands available:

OVERLAY <stringarray> e.g. OVERLAY A\$()
– It is similar to the LIBRARY command, but the

several files can be specified at once, though only one file at a time will be loaded into memory as necessary to search for a procedure to be executed. The search order is: main program, procedures stored in a LIBRARY, procedures INSTALLED, then the OVERLAY files.

SUMLEN <stringarray> e.g. length=SUMLEN F\$() – This is a function which returns the sum of all the elements of a string array.

MOD <array> e.g. a()=MODn() – This returns the modulus (square root of the sum of the squares of each element) of a numeric array.

LOCAL DATA and RESTORE DATA – These are used to set up a local data pointer, in a similar manner to local error structures. The data pointer can now be set relatively by RESTORE +<offset number of lines>.

ERROR EXT e.g. ERROR EXT 99,"Example Error" – This calls the "external" error handler, which is generally the one in operation when BASIC was initialised, i.e. either the operating system or the window manager.

QUIT e.g. quitflag=QUIT – As well as leaving BASIC, this can now be used as a function to test if BASIC was entered with the -quit option, giving the value TRUE (-1) if it was.

Other additions

Assembler – The ARM code assembler now has an additional feature. Bit 3 of the OPT value controls testing of a store limit contained in L%, so a limit on the size of code can be set.

CALL statement – The routines available from the CALL statement have been extended to include, amongst others, access to floating point routines. (Sorry there is just too much information needed to describe this properly)

Array initialisation – As well as being able to do A()=<value>

it is now possible to set the individual elements of the array e.g.

A()=<value1>,<value2>,<value3>,...

For multidimensional arrays, the rule followed is that last subscript changes first e.g. for DIM (2,1) the order is A(0,0); A(0,1); A(1,0); A(1,1); A(2,0); A(2,1). Any unspecified values are not altered.

Error messages

There are several new error messages, and some changes to existing ones. There are now 109, so I have put a list of them on the monthly program disc.

Other changes

There are a few other changes, mainly bug fixes, but it would seem that a few minor alterations have also been made. If you find any changes in the performance of your programs, let me know what these are and I can then pass the message on.

What documentation?

Whilst understanding that Acorn do not wish to have the expense of equipping everyone with a new BASIC manual as the vast majority of it would be the same as the existing one, I think that the changes that have been made really require some generally available documentation, even if this was only a series of printed sheets. So come on Acorn, how about it?

News has just reached me that the full BASIC V manual will be available for £19.95 (£19 through Archive) and that buyers of new 400 series machines will get it free with the computer whereas A3000 owners will have to buy it as an extra.

Table: Speed of various structures in BASIC V

Structure	v1.02	v1.04	%inc
String store	1424	1266	11.1
Integer store	310	251	19.0
FP store	347	290	16.4
String array store	13201	13071	1.0
Integer array store	1068	1071	-0.3
FP array store	2187	2194	-0.3
Expression eval'n	19326	17950	7.1
For...Next (*)	2754	2826	-2.6
Repeat...Until (*)	11173	10062	9.9
While...Endwhile (*)	11451	10316	9.9
PROC (no params)	265	279	-5.3
PROC (with params)	2185	1964	10.1
SYS (name)	3768	2570	7.2
SYS (name) with TO	3369	3108	7.7
SYS (number)	1002	824	17.8
SYS (number) with TO	1603	1362	15.0

All timed for 100000 iterations except (*) which were timed over 10000 iterations. **A**

Shareware Disk N° 10

Alan Highet

Astronomy Set

On the disc is a directory full of procedures for astronomy. They come from a book called 'Astronomy with your personal computer' by Dr. P.J.Duffet-Smith and converted for the Archimedes by Mr. D.A.A.Fangandini. If you wish to use them in your astronomical studies then the purchase of this book is highly recommended! However, if you like brain teasers then why not try getting them to run? I am, and am having very little success as I'm not sure what the end result should be: maybe a trip to the library is called for.

Address Book

This is a full WIMP program to store, sort and find addresses. At the bottom of the screen is a menu bar allowing access to the date and time, disc, search, help windows and palette change. Provided on the disc is a demo file of 100 addresses which most

people will find useful. Once these are loaded, a card index style window is displayed showing four fields, name, address, telephone number and remarks. The search option can be on any one or all of these fields and one or more of the cards can be printed out. A very useful program which is well presented and easy to use.

Colour Selector

A mouse-driven program showing, on the left of the screen, three sliders for red, green and blue and on the right, eight windows showing the colours being worked on. By sliding the settings with the mouse, the selected window changes colour and the RGB numbers are displayed. A nice extra would be the facility to print out the RGB numbers once you have defined them, or even spool them to disc.

Expense Manager

This is an expenses program, again running in a WIMP environment. Unfortunately, it doesn't run

fully under RISC-OS but enough for me to see what was happening. It's basically a notepad style which allows you to enter your day to day expenses. It would probably need modifying for your own use as the categories are car, books, post, phone and other. Although it's obviously designed to be used on a daily basis, it would be nice to be able to specify the date, instead of using the system's date, and also to modify an entry. One other problem is that the print option prints everything twice but this might be due to the incompatibility with RISC-OS.

Reversi

This is a good implementation of the board game. For those who don't know the rules, you play either black or white and take turns to place your counter on an eight by eight grid. Any counters of the opponent that are trapped between this counter and any other of yours become your colour. The winner is the player who ends up with the most counters on the board. This version gives you the option of playing either black or white, playing against the computer or another player, or the computer playing both sides. It also gives you the option to replay the last game. While it plays a very good

game, it is an adapted version of a Beeb game and makes no use of the improved graphics on the Archimedes—it plays in mode five. Having said that it is still worth playing.

Star Trek

There have been many versions of this game but this is certainly the most colourful I've played. It is played almost totally with the mouse by selecting the options from various icons on the screen. The main window normally displays a map of the 8x8x8 playing board with good graphics of the Enterprise, the Klingons and the space stations. I am thoroughly enjoying playing this game and my only grumble is that because everything is chosen via icons, I have to keep referring to the on-screen info to find out which icon does what, but I'm sure that with practice it will all become clearer.

Wire Frame Cups

This is really just a graphics demo. You are given a straight line on the screen which you can alter by moving points on the line with the cursor keys. When you have finished, the program rotates your line about the centre line and produces a 3D projection. **A**

Computerware Hard Disks

Gary Orford and David Leckie

We have had reviews from two of our readers who have had experience of the Computerware Hard Disc System. Both had (different) problems but both seemed to get the problems sorted out in the end. It should be noted that these represent some of the earliest systems sent out by Computerware and so lessons learned from these early teething problems will, hopefully, mean less trouble for later buyers. Garry Orford kicks of...

One of the most useful add-ons for a microcomputer is a hard disc system because it ensures that all files are readily and rapidly available. With RISC-OS, it becomes even more desirable with the elimination of those "Message from ADFS - Insert disc App1" type of warnings. It is not surprising that several manufacturers are producing hard disc systems for the Archimedes 300 range. This is a review of the package from Computerware.

The backplane

Hard disc systems require the installation of a hard disc podule which plugs into a backplane. The Computerware 4-slot backplane appears adequately manufactured but intending purchasers should be aware that Acorn have not approved the design and it is possible that the addition of other podules could cause trouble, especially if, like Computer Concepts' Fax Pack, they draw a lot of current. The backplane is simple to install, the only possible snag being the possibility of losing a mounting bolt into the power supply which though this be the same for other makes.

The fan

Originally I received a duff fan which was speedily replaced. The replacement fan proved astonishing. When switched on, it whizzed round at high speed, shifting vast quantities of air and producing a totally unacceptable noise reminiscent of Rolls Royce testing a turbine! A series resistor (say 68 ohms

half-watt) would reduce the noisy gale but **any** such modification may well invalidate your guarantee.

The podule

The podule turned up in an interesting plastic bag which appeared to have a low electrical resistance. It has a workmanlike look about it (helps boost confidence) and was simple to fit. It seems expensive for so little electronics but at the time of writing, is the cheapest available. Unlike the Watford Electronics podule, it provides the output for another, external hard drive which may well prove useful in these days of mega-files and, unlike the Acorn podule, it has sockets for this on the back-plate.

The hard drive

The 20 MB drive arrived very well packed, as is necessary for a delicate mechanism. Fitting the drive requires the removal of the front cover of the Archimedes. Replacing this cover proved extremely fiddly and the worst part of the whole exercise. The power plug on the drive had a locating lug which was not matched in the associated Archimedes socket and therefore had to be pared off with a small knife in order that the two would mate.

The software

The moment of truth! Switching on produced a few squawks from the drive and no smoke, so all appeared well. The disc arrived ready formatted and complete with a formatting program (to be copied to at least one backup floppy). The formatting software did not cover details of the supplied drive which had to be obtained by telephone from Computerware. No problems were experienced in partitioning the disc for ADFS and MS-DOS use.

RISC-OS

Two weeks after getting the system running, RISC-OS was installed into the computer. This prevented the hard disc from reading any files written under RISC-OS! Another phone call resulted in the return of the podule to Computerware for modification and the system now functions again. (*It actually now works faster than it did under Arthur. Ed.*) I have not checked to ascertain whether it would still work under Arthur 1.2. (*It does. Ed.*)

Conclusions

Despite the various frustrating delays, the system works well. The hard disc, once a suitable directory

structure is set-up, makes the Archimedes much quicker to use and makes the PC Emulator usable. Unless large random-access files are to be continually used, the access time of 40 ms is entirely acceptable. It is the noisiest system I have ever encountered but it is also the cheapest for the Archimedes. Fitting the system is straightforward for anyone with the correct number of fingers and thumbs. The Archimedes with RISC-OS and a hard disc makes the usual PC look tiresome.

And now, here is David Leckie's experience...

Computerware Hard Discs

Like all Archimedes owners I found the single 3.5" floppy limiting but thought that the Acorn hard disc podule was over priced for a 20 Mb unit. Also, as I run a lot of MS-DOS software under the emulator a 20 Mb would be rather small when partitioned 10 Mb and 10 Mb.

Thus when, in October 1988, Computerware started to advertise hard discs and podules I immediately contacted them about a 30 Mb system. Though they were at this stage only ready to supply 20 Mb units they agreed to do a special 30 Mb unit and podule for me. However, because of chip supply problems, it did not arrive until just before Christmas.

To cut a long story short, there were a succession of problems including drives that did not work and a clash with the I/O podule.

In the end, although Computerware said that I could have a complete refund, I decided instead to take advantage of a special price offer to part exchange the 30 Mb system for one of their new 40 Mb systems.

The 40 Mb drive

The new 40 Mb drive turned out to be a 3.5" Rodime RO 3055. The drive is very smooth and quiet. Instead of using a stepper motor to position the heads it uses a voice coil. While a stepper motor steps the head incrementally from track to track on the disc a voice coil positioner moves the head smoothly and directly to the track where the data is located. This results in much faster access times. Computerware quote an access time of 28 ms, but a review of the drive in Byte magazine found its access time to be more like 22 ms.

This combined with the Archimedes 16 bit I/O data bus (only the internal data bus is 32 bit) and the fast Hitachi HD 63463 controller gives incredible access speeds.

Setting up

*FREE gave a value slightly over 40 Mb, however it was noted that Rodime quote the drive as having 872 cylinders and 7 heads but Computerware use 827 cylinders and 6 heads to format the disc.

There was a slight problem fitting the actual disc. The power connection is on the RHS of the disc and the Archimedes PSU cable was too short to reach as it is designed for drives with PSU connections on the LHS. A short extension cable overcame this problem – taken from the now redundant Dudley Micro Supplies second floppy drive interface.

More problems

I decided to partition the disc 20 Mb MS-DOS and 20 Mb to ADFS. To do this, it was necessary to slightly modify the HARDDISK program that comes with the emulator as it gives a 10 Mb partition. This is very easy to do because there are plenty of REM statements in the program.

Computerware allowed me to keep the old drive until I had time to transfer the data between the two drives. So, for a short while, I had 'harddiscs' set to 2 and used the external connections on the podule to connect up the old 30 Mb drive, power being taken from a BBC micro using a BBC floppy drive power connector. All worked perfectly. First I renamed the MS-DOS partition to DRIVE_D and used XCOPY to copy it. I then deleted DRIVE_D and used *COPY to copy all the other data.

Value for money?

In the past, the cost of Archimedes hard discs has been compared unfavourably with PC harddisc

systems. However it is only fair to compare like with like, there is just no comparison between a cheap (£200) slow (65ms) noisy PC XT clone hard disc system and the Archimedes hard disc system.

The RO 3055 is quoted in Byte at \$1395+tax (£800). Computerware do it at £590 complete with podule. As the podule alone costs £240 they are in fact selling the drive for £350 – excellent value for a state of the art voice coil 40 Mb drive!

The price/value of the podule is more difficult to evaluate, all the components except the HD 63463 controller are relatively cheap and common. Computerware have obviously to recoup R&D costs (unlike PC clones) and make a profit. Also, they can never expect the volume sales of PC clone systems.

Conclusion

The 40 Mb system is excellent value for performance and Computerware are a good company to deal with. They don't cash cheques until the goods are ready for dispatch. In the past, they have exchanged goods without waiting for the old ones to be returned.

If you are looking for a cheap, mediocre performance you should have bought a PC clone in the first place and not an Archimedes!

The only criticisms are:

- 1) That they started advertising their goods before they were ready and did not test the early (now discontinued) 30 Mb system properly before dispatch, (but then I was pushing them hard for the goods).
- 2) Their hard disc backup program has not yet appeared.
- 3) The problem with the hard disc podule, RISC-OS and the I/O podule has still to be resolved.
- 4) The PSU cable problem. **A**

No Room!!!!!!

I'm afraid that we've run out of space (yet again!). The articles that would not fit in (despite maintaining the extra 4 pages begun a couple of months ago) are all reviews: Archway, Home Accounts, Plague Planet, Risc User Special Disk, Shareware N°9 and Realtime Solids Modeller.

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